557.3
T5
M7X
NH

DEPARTMENT OF THE INTERIOR

MONOGRAPHS

OF THE

UNITED STATES GEOLOGICAL SURVEY

VOLUME LI

Part II.—PLATES

SMITHSONIAN INSTITUTION
223285
U. S. NATIONAL MUSEUM

WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

557.3
U76
v.51
pt.2

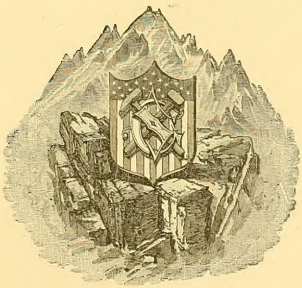
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

CAMBRIAN BRACHIOPODA

BY

CHARLES D. WALCOTT

Part II.—PLATES



WASHINGTON
GOVERNMENT PRINTING OFFICE
1912

PLATE I.

PLATE I.

a. Area.
cl. Cardinal scars.
h. Central muscle scar.
j. Anterior lateral muscle scars.
n. Cast of short ridge in advance of apex.
p. Pedicle furrow.
s. Median septum (see fig. 47A, p. 567).
t. Ridges mentioned in the text (see fig. 47A, p. 567).
t′. Depressed cardinal area (see fig. 47A p. 567).
v. Visceral area.

Rustella edsoni Walcott (p. 327).

Figures 1 and 1a. Casts of the exterior of compressed ventral valves from Locality **25**, Lower Cambrian, Georgia, Vermont. U. S. Nat. Mus. Cat. Nos. 51412a and 51412b, respectively. Specimens represented by figs. 1 and 1a were figured by Walcott [1886b, Pl. IX, figs. 1h and 1g, respectively; and 1891a, Pl. LXIX, figs. 1h and 1g, respectively] as ventral valves of *Kutorgina cingulata*. Figure 1 is the type.

1b. Cast of the interior of a ventral valve from Locality **49a**, Lower Cambrian, York, Pennsylvania. U. S. Nat. Mus. Cat. No. 51463a.

1c. Cast of the interior of a ventral valve from Locality **25**, Lower Cambrian, Georgia, Vermont. U. S. Nat. Mus. Cat. No. 51412c.

1d and 1e. Casts of the exterior of dorsal valves from Locality **392o**, Vermont. U. S. Nat. Mus. Cat. Nos. 52035a and 52035b, respectively.

Curticia elegantula Walcott (p. 369).

Figures 2, 2′, 2″. Top and back views and side outline of the exterior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51902a.

2a, 2a′, 2a″. Top, side, and back views of a more nearly circular ventral valve than that represented by fig. 2. U. S. Nat. Mus. Cat. No. 51902b.

2b. Top and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 51902c.

2c. Partly exfoliated ventral valve showing inner layers of the shell. U. S. Nat. Mus. Cat. No. 51902d.

2d. Posterior view of an elevated ventral valve having a large delthyrium. U. S. Nat. Mus. Cat. No. 51902e.

2e. Posterior view of a ventral valve with very low delthyrium. U. S. Nat. Mus. Cat. No. 51902f.

2f. Back view of the cast of a ventral valve. U. S. Nat. Mus. Cat. No. 51902g.

2g. Posterior portion of the cast of a ventral valve. U. S. Nat. Mus. Cat. No. 51902h.

2h, 2i, and 2j. Exterior of dorsal valves and side outlines. U. S. Nat. Mus. Cat. Nos. 51902i, 51902j, and 51902k, respectively.

2k. Interior of a dorsal valve with a trace of muscle scars near the apex. U. S. Nat. Mus. Cat. No. 51902 l.

2l. Cast of the interior of a dorsal valve, retaining a portion of the shell. U. S. Nat. Mus. Cat. No. 51902m. Another specimen (Cat. No. 51902n) was used also in drawing fig. 2 l.

The specimens represented are all from Locality **82b**, Upper Cambrian, "St. Croix sandstone," Taylors Falls, Chisago County, Minnesota.

Neobolus warthi Waagen (p. 566).

[Text figs. 47A-B, p. 567, and Pl. LXXXI, figs. 2, 2a-h.]

Figure 3. This specimen is figured by Waagen [1885, Pl. LXXXIV, fig. 7; and 1891, Pl. II, fig. 8c] as the interior of a dorsal valve of *Neobolus warthi*. It may possibly be an old shell, worn by rolling in the sand. Geol. Survey India Cat. No. 3/779.

4 and 4′. Exterior and back views of a specimen of the ventral valve. Geol. Survey India Cat. No. 3/776. Specimen figured by Waagen [1885, Pl. LXXXIV, fig. 4; and 1891, Pl. II, fig. 5] as *Neobolus warthi*.

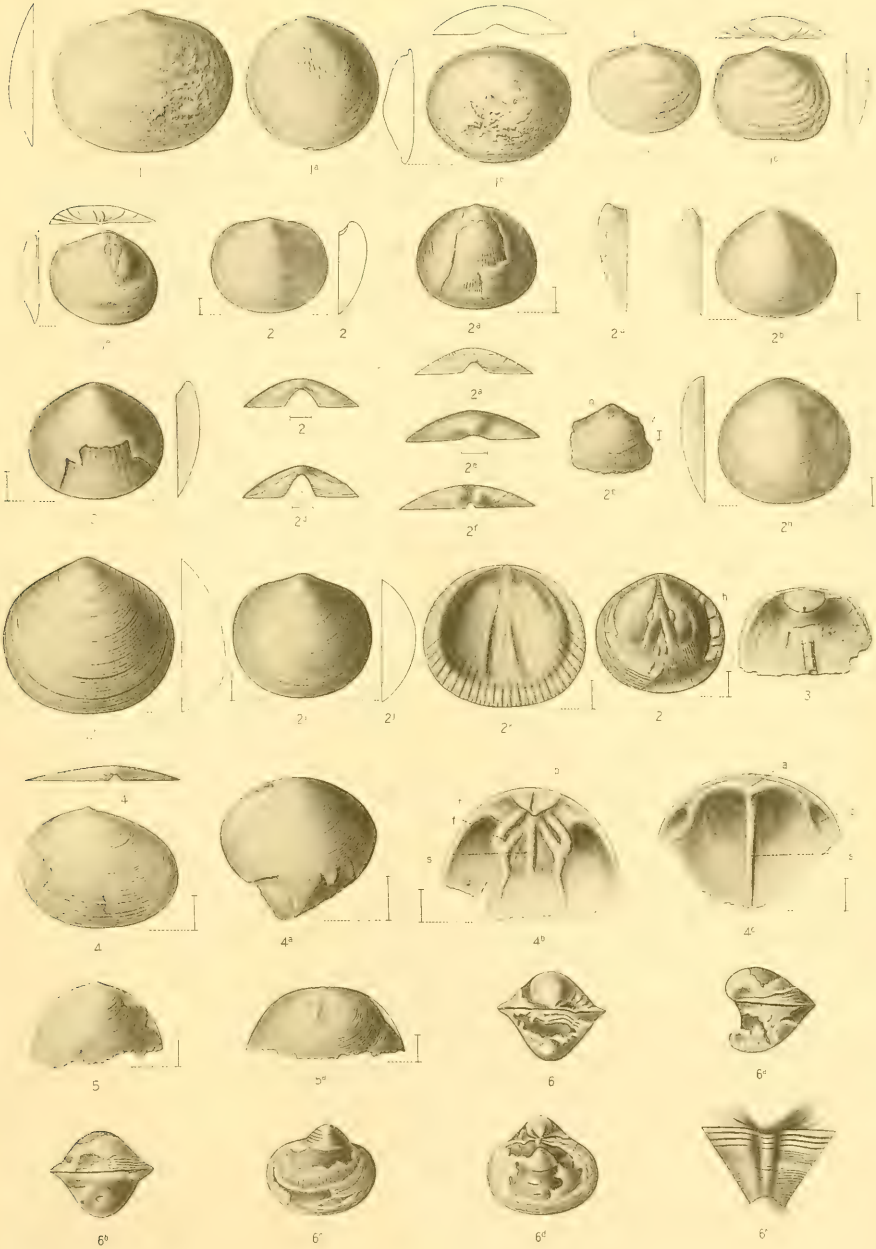
4a. Specimen of the dorsal valve. Geol. Survey India Cat. No. 3/777. Specimen figured by Waagen [1885, Pl. LXXXIV, figs. 5a–b; and 1891, Pl. II, figs. 8a–b] as *Neobolus warthi*.

4b. This figure, which is diagrammatic and incorrect, is replaced by text figure 47A, p. 567. Interior of a dorsal valve from a cast made in a natural mold. Original in the collection of the Geological Survey of India (Cat. No. 3/780); cast in the United States National Museum (Cat. No. 56909a).

5. Ventral valve described and illustrated by Waagen [1885, p. 759, Pl. LXXXV, figs. 1a–c; and 1891, Pl. II, figs. 11a–b] as *Neobolus wynnei*. Geol. Survey India Cat. No. 3/781.

5a. Dorsal valve described and illustrated by Waagen [1885, p. 759, Pl. LXXXV, figs. 2a–c; and 1891, Pl. II, figs. 10a–b] as *Neobolus wynnei*. Geol. Survey India Cat. No. 3/782.

All the specimens from which the above figures of *Neobolus warthi* are drawn are from Locality **357c**, the *Neobolus* beds of the Khussak group of the Middle Cambrian, Kiura, Salt Range, India.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

Schizopholis rugosa Waagen (p. 609).

[Pl. LXXXI, figs. 1, 1a–c.]

Figure 4c. Interior of a dorsal valve from a cast made in a natural mold. The casts were obtained first by dissolving the shells and then taking wax and plaster casts of the uninjured natural molds. From Locality **357c**, the *Neobolus* beds of the Khussak group of the Middle Cambrian, Kiura, Salt Range, India. Original in the collection of the Geological Survey of India (Cat. No. 3/780); cast in the United States National Museum (Cat. No. 56910a).

Volborthia recurva (Kutorga) (p. 366).

[Text figs. 33A–B, p. 366.]

Figures 6, 6a, 6b, 6c, and 6d. Posterior, side, front, ventral, and dorsal views of the type specimen, a partly exfoliated shell which has the two valves united, from Locality **336g**, Ordovician glauconitic limestone at Zarskoe Selo, Government of St. Petersburg, Russia.

6e. View of the false area of the ventral valve represented in figs. 6, 6a–d. The false area of this shell has been illustrated by photography in text figs. 33A and 33B, p. 366.

Figures 6, 6a–e are copied from von Möller [1874, Pl. VII, figs. 1–6, respectively]. Original specimen in the collection of the Museum at Reval, Esthonia, Russia; cast in the United States National Museum (Cat. No. 58298).

PLATE II.

PLATE II.

MICROMITRA (PATERINA) BELLA (Billings) (p. 344).

FIGURE 1. Apical, posterior, and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 51417a. Until the specimen represented by fig. 1c is found this valve may be regarded as typical of the species. (See pp. 335 and 350 and fig. 6 of this plate.)

1a. Summit, posterior, and side views of a dorsal valve. U. S. Nat. Mus. Cat. No. 51417b.

1b. Dorsal valve, showing a somewhat more elevated beak than in figure 1a. U. S. Nat. Mus. Cat. No. 51417c.

The specimens represented by figures 1, 1a–b are all from Locality **49w**, Lower Cambrian limestone one-fourth mile south of Emigsville, York County, Pennsylvania.

FIGURE 1c. Type specimen, from Locality **2n**, Lower Cambrian limestone bowlders in conglomerate at Trois Pistoles, Quebec. Copied from Billings [1872b, fig. 13, p. 477]. The figure has been widely copied (see p. 344), but the specimen from which it was drawn can not be located. (See pp. 335 and 350 and fig. 6 of this plate.)

MICROMITRA (PATERINA) LABRADORICA (Billings) (p. 347).

FIGURE 2. Enlarged drawing of the type specimen, from Locality **392a**, Lower Cambrian at L'Anse au Loup, Straits of Belleisle, Labrador. Geol. Survey Canada. Specimen originally figured by Billings [1861b, fig. 6, p. 6].

2a. Dorsal valve. U. S. Nat. Mus. Cat. No. 18309a. Specimen figured by Walcott [1891a, Pl. LXIX, fig. 3b] as *Kutorgina labradorica*.

2b. Posterior view of a small ventral valve. U. S. Nat. Mus. Cat. No. 18309b.

2c. Partly exfoliated shell of a ventral valve. U. S. Nat. Mus. Cat. No. 18309c. Specimen figured by Walcott [1891a, Pl. LXIX, fig. 3a] as *Kutorgina labradorica*.

2d. A more elevated ventral valve, which has been partly broken away along the cardinal margin. U. S. Nat. Mus. Cat. No. 18309d. Specimen figured by Walcott [1891a, Pl. LXIX, fig. 3] as *Kutorgina labradorica*.

The specimens represented by figures 2a–d are from Locality **41a**, Lower Cambrian limestone at Topsail Head, Conception Bay, Newfoundland.

FIGURE 2e. Dorsal valve from Locality **3a**, Lower Cambrian shale on Hanford Brook, St. John County, New Brunswick, Canada. U. S. Nat. Mus. Cat. No. 51428a.

2f. Ventral valve associated with specimen represented by figure 2e. U. S. Nat. Mus. Cat. No. 51428b.

MICROMITRA (PATERINA) LABRADORICA SWANTONENSIS (Walcott) (p. 348).

FIGURE 3. Apical view and side outline of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 15329a.

3a. Apical view and side outline of a more elevated ventral valve. U. S. Nat. Mus. Cat. No. 15329b.

3b. Dorsal valve associated in the same block of limestone with the specimen represented by figure 3a. U. S. Nat. Mus. Cat. No. 15329c.

The specimens represented by figures 3, 3a–b were figured by Walcott [1886b, Pl. IX, figs. 2, 2a–b, respectively] as *Kutorgina labradorica*, and [1891a, Pl. LXIX, figs. 2, 2a–b, respectively] as *Kutorgina labradorica swantonensis*.

FIGURE 3c. Longitudinal section of a ventral valve showing the presence of a short pseudodeltidium. U. S. Nat. Mus. Cat. No. 15329d.

The specimens represented by figures 3, 3a–c are all from Locality **25a**, Lower Cambrian limestones, 2 miles east of Swanton, Franklin County, Vermont.

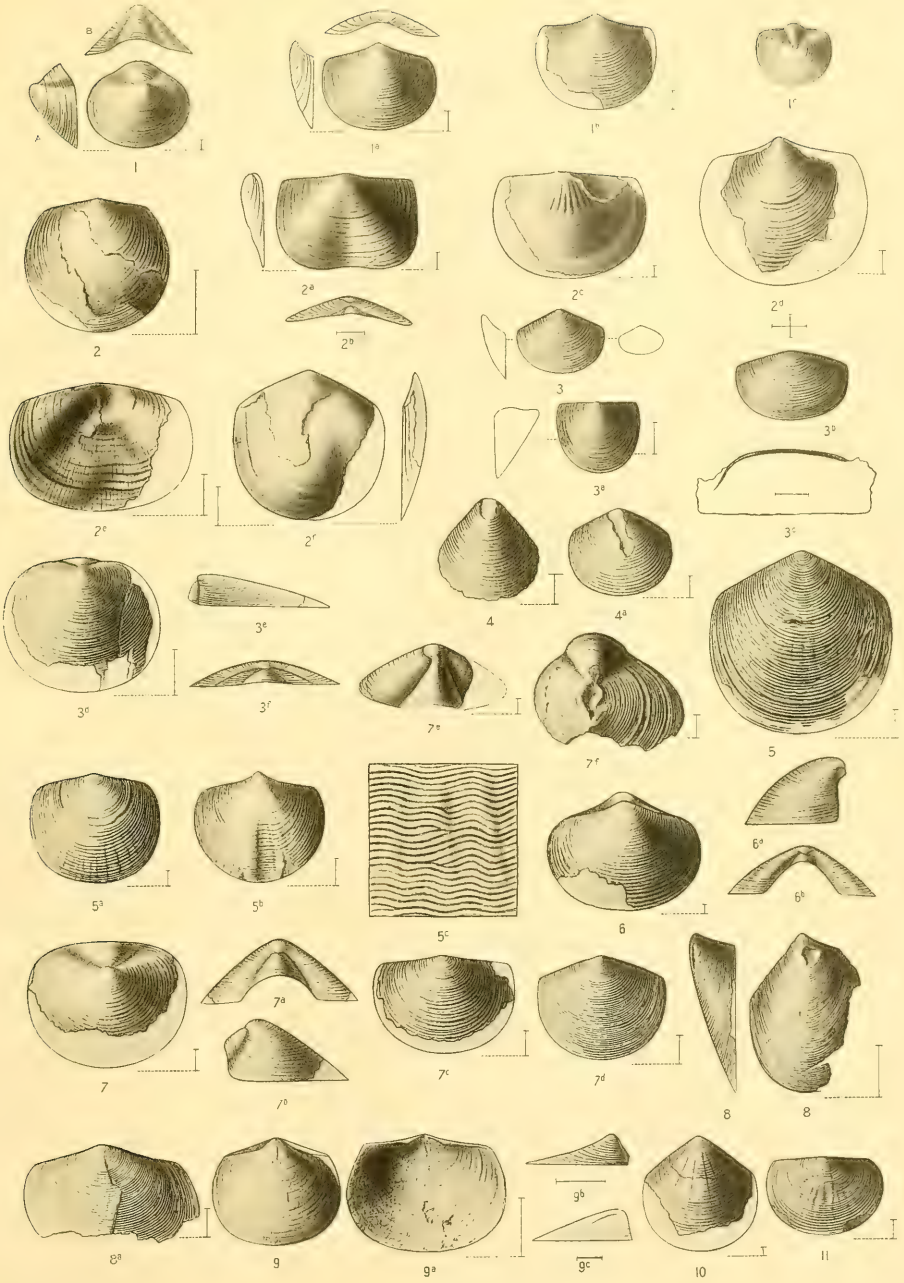
FIGURES 3d, 3e, and 3f. Apical, side, and posterior views of a specimen preserving the area and pseudodeltidium. This specimen can not be located. The drawing was labeled as having been made from a specimen in the collections of the American Museum of Natural History, but the officials inform me that they have no record of such a specimen. The locality is unknown.

MICROMITRA (PATERINA) PROSPECTENSIS (Walcott) (p. 352).

FIGURE 4. Apical view of the type specimen, a ventral valve, from Locality **52**, Lower Cambrian sandy shales, summit of Prospect Mountain, Eureka district, Nevada.

4a. Dorsal valve associated with the ventral valve represented by figure 4.

The specimens represented by figures 4 and 4a were figured by Walcott [1884b, Pl. IX, figs. 1a and 1, respectively; 1886b, Pl. IX, figs. 3 and 3a, respectively; and 1891a, Pl. LXIX, figs. 4 and 4a, respectively] as *Kutorgina prospectensis*. U. S. Nat. Mus. Cat. Nos. 15335a and 15335b, respectively.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

MICROMITRA ALABAMAENSIS (Walcott) (p. 337).

FIGURE 5. Apical view of the type specimen, a compressed ventral valve, from Locality **121**, Middle Cambrian Rogersville shale, 4 miles northeast of Rogersville, Tennessee. U. S. Nat. Mus. Cat. No. 51416a. Specimen figured by Walcott [1897b, Pl. LIX, fig. 5] as *Iphidea alabamaensis*.

5a. Dorsal valve from Locality **94a**, Middle Cambrian Conasauga shale, Coosa Valley, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 56888a. Specimen figured by Walcott [1897b, Pl. LIX, fig. 5a] as *Iphidea alabamaensis*.

5b. Ventral valve having a slight median depression, from Locality **14a**, Middle Cambrian Rogersville shale, 4 miles north-northeast of Knoxville, Knox County, Tennessee. U. S. Nat. Mus. Cat. No. 51413a.

5c. Outer surface of shell from Locality **94**, Middle Cambrian Conasauga shale, Cowan Creek section, Cherokee County, Alabama, enlarged to show the tendency to form crenulations in the striæ. U. S. Nat. Mus. Cat. No. 26432a. This bit of surface was figured by Walcott [1897b, Pl. LIX, fig. 5b] as part of the surface of figure 5, magnified; it is, however, taken from another specimen.

MICROMITRA (PATERINA) LOGANI (Walcott) (p. 350).

FIGURES 6, 6a, and 6b. Apical, side, and posterior views of the type specimen, from Locality **2n**, Lower Cambrian pebbles in conglomerate at Trois Pistoles, on the St. Lawrence, Province of Quebec, Canada. Coll. Geol. Survey Canada. Specimen figured by Walcott [1897b, Pl. LIX, figs. 2, 2a–b] as *Iphidea logani*. In the Canadian Survey collections it was labeled as the type of "Iphidea bella Billings." (See pp. 345 and 350 and figs. 1 and 1c of this plate.)

MICROMITRA (PATERINA) SUPERBA (Walcott) (p. 355).

[Text figs. 27A–B, p. 355.]

FIGURES 7, 7a, and 7b. Apical, side, and posterior views of the type specimen, a ventral valve, from Locality **73a**, Middle Cambrian sandy "Tonto" shale, Chuar Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 26429a. Specimen figured by Walcott [1897b, Pl. LIX, figs. 1a–c] as *Iphidea superba*.

7c. Specimen of the dorsal valve associated with the specimen represented by figure 7. U. S. Nat. Mus. Cat. No. 26429b. Specimen figured by Walcott [1897b, Pl. LIX, fig. 1] as *Iphidea superba*.

7d. Nearly perfect dorsal valve from Locality **74**, Middle Cambrian sandy "Tonto" shale at head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 51487a.

7e. Posterior view of ventral valve, from Locality **8j**, Middle Cambrian shale, near Gordon Mountain, Ovando quadrangle, Montana, showing pseudodeltidium. U. S. Nat. Mus. Cat. No. 51488a.

7f. A crushed and broken ventral valve, associated with the valve represented by figure 7e, showing pseudodeltidium. U. S. Nat. Mus. Cat. No. 51488b.

MICROMITRA (PATERINA) LABRADORICA UTAHENSIS (Walcott) (p. 349).

[Text fig. 24, p. 350.]

FIGURES 8 and 8′. Summit and side views of the type specimen, a ventral valve laterally compressed. U. S. Nat. Mus. Cat. No. 51431a.

8a. Posterior half of a ventral valve somewhat distorted by compression. U. S. Nat. Mus. Cat. No. 51431b.

The specimens represented are both from Locality **3d**, Middle Cambrian, Oquirrh Range, near Ophir, Utah.

WIMANELLA SHELBYENSIS Walcott (p. 747).

FIGURE 9. Type specimen, the ventral valve, flattened in the shale. Copied from Walcott [1908d, Pl. X, fig. 3].

9a. Interior of a flattened dorsal valve.

The specimens represented are both from Locality **17b**, Lower Cambrian Rome ("Montevallo") formation, 4 miles south of Helena, Shelby County, Alabama. U. S. Nat. Mus. Cat. Nos. 52272a and 52272b, respectively.

MICROMITRA (PATERINA) WILLIARDI Walcott (p. 358).

[Text figs. 30A–E, p. 358.]

FIGURES 9b and 9c. Side outlines of ventral valves. Drawn from casts taken in a natural mold from Locality **17b**, Lower Cambrian Rome ("Montevallo") formation, 4 miles south of Helena, Shelby County, Alabama. U. S. Nat. Mus. Cat. Nos. 51481a and 51481b, respectively.

MICROMITRA NISUS (Walcott) (p. 338).

FIGURE 10. Exterior of type specimen, ventral valve, from Locality **2r**, Lower Cambrian, 2 miles west of Bic, Province of Quebec, Canada, showing radiating ridges. U. S. Nat. Mus. Cat. No. 51440a.

MICROMITRA (PATERINA) LABRADORICA ORIENTALIS (Walcott) (p. 348).

FIGURE 11. Exterior of type specimen, dorsal valve, from Locality **C9**, Middle Cambrian limestone, Kiulung group, 3 miles southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52516a.

PLATE III.

PLATE III.

Micromitra (Paterina) stissingensis (Dwight) (p. 353).

Figure 1. Apical view of the type specimen, a ventral valve. U. S. Nat. Mus. Cat. No. 51484a. Specimen figured by Dwight [1889, Pl. VI, fig. 6] as *Kutorgina stissingensis.*

1a. Dorsal valve, flattened in the shale. U. S. Nat. Mus. Cat. No. 51484b. The rear view of this specimen was given by Dwight [1889, Pl. VI, fig. 8].

1b. Apical view of a cast in limestone of a ventral valve. U. S. Nat. Mus. Cat. No. 51484c.

1c. Interior of a typical specimen of a compressed dorsal valve. U. S. Nat. Mus. Cat No. 51484d. Specimen figured by Dwight [1889, Pl. VI, fig. 5] as *Kutorgina stissingensis.*

1d. Posterior view of a compressed ventral valve that shows the area of a narrow pseudodeltidium.

The specimens represented by figures 1, 1a–d are from Locality **367d**, Middle Cambrian, vicinity of Stissing, Dutchess County, New York.

Figure 1e. Specimen doubtfully referred to this species from Locality **14s**, Middle Cambrian, *Ogygopsis* zone, Mount Stephen, British Columbia. U. S. Nat. Mus. Cat. No. 51483a.

Micromitra pusilla (Linnarsson) (p. 339).

Figures 2 and 2a. Apical and posterior views of a ventral valve. U. S. Nat. Mus. Cat. No. 51478a.

2b and 2b′. Top and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 51478b.

2c. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51478c.

The specimens represented are all from Locality **8w**, Middle Cambrian limestones near Andrarum, Sweden.

Micromitra pealei (Walcott) (p. 339).

Figures 3, 3a, and 3b. Apical, side, and posterior views of the type specimen, from Locality **155a**, Middle Cambrian limestone near Hillsdale, Montana. U. S. Nat. Mus. Cat. No. 26430a. Specimen figured by Walcott [1897b, Pl. LIX, figs. 3, 3a–b] as *Iphidea pealei.*

3c. Dorsal valve from the same bed of limestone as the ventral valve represented by figure 3. U. S. Nat. Mus. Cat. No. 26430b. Specimen figured by Walcott [1897b, Pl. LIX, fig. 3c] as *Iphidea pealei.*

3d. Ventral valve with strong radiating ridges, from Locality **159**, Middle Cambrian limestone, north of West Gallatin (Gallatin) River, Montana. U. S. Nat. Mus. Cat. No. 51471a.

3e and 3e′. Top and back views of a transverse dorsal valve with strong radiating ridges, from Locality **5f**, Middle Cambrian limestone, 12 miles south of Neihart, Montana. U. S. Nat. Mus. Cat. No. 51470a.

Micromitra (Paterina) crenistria (Walcott) (p. 345).

Figures 4, 4a, and 4b. Apical, side, and posterior views of the type specimen, from Locality **74**, Middle Cambrian limestone, Tonto group, near the head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 26431a. Specimen figured by Walcott [1897b, Pl. LIX, figs. 4, 4a–b] as *Iphidea crenistria.*

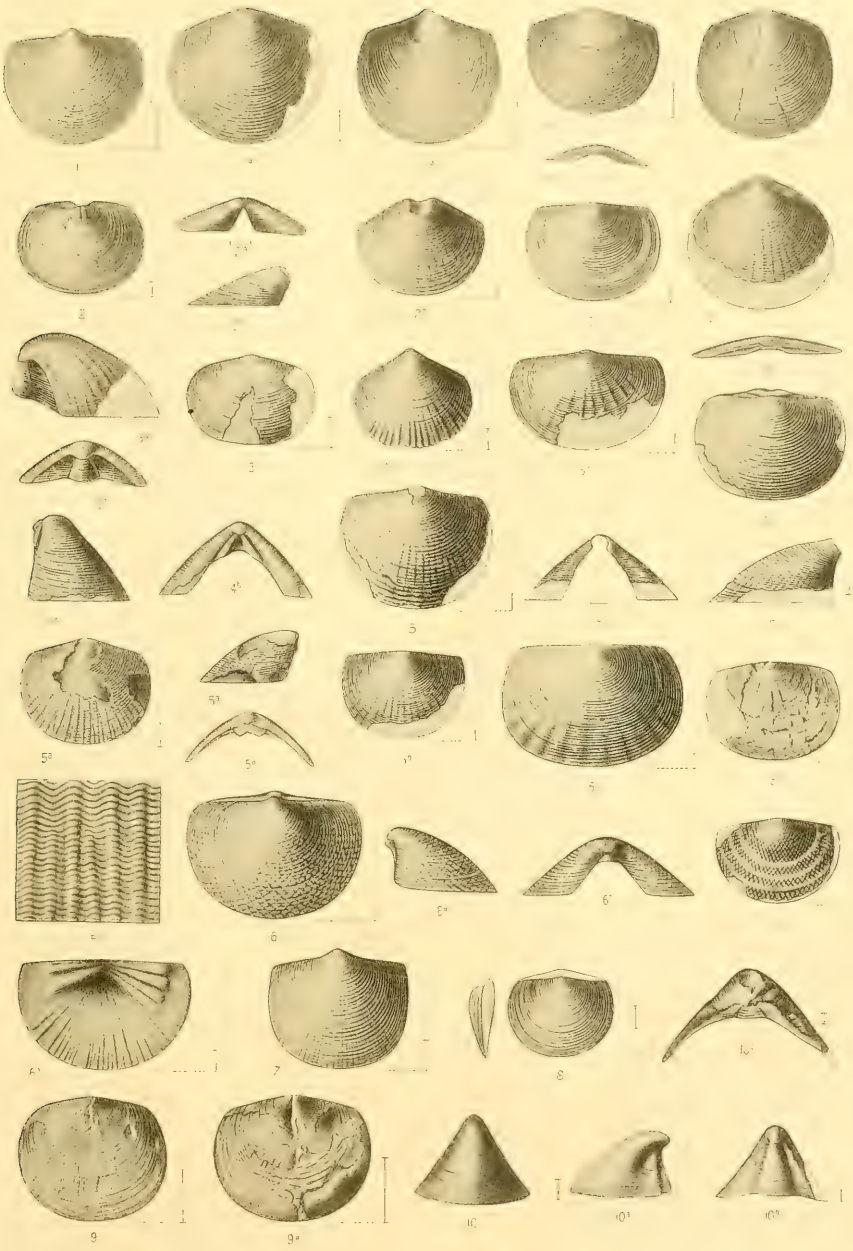
Micromitra sculptilis (Meek) (p. 341).

Figures 5, 5′, and 5″. Apical, side, and posterior views of the type specimen, from Locality **302**, Middle Cambrian limestone east of West Gallatin (Gallatin) River, Montana. U. S. Nat. Mus. Cat. No. 7864a. Specimen figured by Walcott [1884b, Pl. I, figs. 7, 7a] as *Kutorgina sculptilis.*

5a, 5a′, and 5a″. Top, side, and back views of a ventral valve from Locality **302b**, Middle Cambrian limestones near Crowfoot Ridge, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 35212a. Specimen figured by Walcott [1899, Pl. LX, figs. 5, 5a–c]. A portion of its surface is enlarged in figure 5e.

5b. Dorsal valve from Locality **58**, Middle Cambrian Secret Canyon shale, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 24551a. Specimen figured by Hall and Whitfield [1877, Pl. I, fig. 11] as *Kutorgina minutissima;* and by Walcott [1884b, Pl. I, fig. 7b] as *Kutorgina sculptilis.*

5c. Dorsal valve associated with the shell represented by fig. 5b. U. S. Nat. Mus. Cat. No. 24551b. Specimen figured by Hall and Whitfield [1877, Pl. I, fig. 12] as *Kutorgina minutissima;* and by Walcott [1884b, Pl. IX, fig. 7] as *Kutorgina sculptilis.*



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

MICROMITRA SCULPTILIS (Meek)—Continued.

FIGURE 5d. Crushed ventral valve from Locality **8i**, Middle Cambrian shaly Marjum limestone near Antelope Springs, House Range, Utah. U. S. Nat. Mus. Cat. No. 51494a.

5e. A portion of the surface of the specimen represented by figure 5a, greatly enlarged. U. S. Nat. Mus. Cat. No. 35212a.

MICROMITRA (IPHIDELLA) ORNATELLA (Linnarsson) (p. 360).

FIGURES 6, 6a, and 6b. Apical, side, and posterior views of a typical specimen from Locality **320f**, Middle Cambrian limestone at Andrarum, Sweden. U. S. Nat. Mus. Cat. No. 26667a.

6c. Dorsal valve from Locality **8w**, Middle Cambrian limestone near Andrarum, Sweden. U. S. Nat. Mus. Cat. No. 51460a.

6d. Interior of a dorsal valve from Locality **16h**, Middle Cambrian shale at Borregaard, Bornholm, Denmark. U. S. Nat. Mus. Cat. No. 51490a.

MICROMITRA sp. undt. (Walcott) (p. 343).

FIGURE 7. Dorsal valve from Locality **302b**, Middle Cambrian limestones near Crowfoot Ridge, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 51509a. Specimen figured by Walcott [1899, Pl. LX, fig. 6] as "*Iphidea*, sp. undet."

MICROMITRA (PATERINA) PHILLIPSI (Holl) (p. 351).

FIGURE 8. Top view of dorsal valve and side outline of valves from Locality **304g**, Upper Cambrian Hollybush sandstones, Malvern Hills, England. Copied from Davidson [1866, Pl. IV, figs. 17a and 17c]; Davidson's figures were drawn from the type specimen illustrated by Holl [1865, p. 102, figs. 10b and 10c].

MICROMITRA (IPHIDELLA) NYSSA Walcott (p. 360).

FIGURE 9. Top view of type specimen, a ventral valve. Copied from Walcott [1908d, Pl. VII, fig. 5].

9a. Top view of dorsal valve.

The specimens represented are both from Locality **4q**, Middle Cambrian shale, near Gordon Mountain, Ovando quadrangle, Montana. U. S. Nat. Mus. Cat. Nos. 51441a and 51441b, respectively.

MICROMITRA (PATERINA) ETHERIDGEI (Tate) (p. 346).

FIGURE 10. Top view of type specimen, a ventral valve from Locality **315**, Middle Cambrian at Curramulka, South Australia. Original in the collection of the University of Adelaide, South Australia; cast in the United States National Museum (Cat. No. 58301). Specimen figured by Tate [1892, Pl. II, figs. 7a–c] as *Platyceras etheridgei*.

10a and 10b. Side and back views of ventral valve represented in figure 10. Original in the collection of the University of Adelaide; cast in the United States National Museum (Cat. No. 58301).

10c. Back view of another ventral valve from the same locality as the valve represented by figure 10. Original in the collection of the University of Adelaide; cast in the United States National Museum (Cat. No. 58302).

PLATE IV.

PLATE IV.

MICROMITRA (IPHIDELLA) PANNULA (White) (p. 361).

[Text fig. 32, p. 362, and Pl. IV, figs. 3 and 3a.]

FIGURES 1 and 1a. Apical and side views of a ventral valve from Locality **74**, Middle Cambrian "Tonto" sandstone Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 51446a.

1b. Dorsal valve from Locality **149a**, Middle Cambrian limestone on Pole Creek, Madison County, Montana. U. S. Nat. Mus. Cat. No. 51445b.

1c. Dorsal valve from Locality **14**, Middle Cambrian limestone 7 miles southwest of Rome, Floyd County, Georgia. U. S. Nat. Mus. Cat. No. 51444c.

1d and 1e. Posterior and side views of ventral valve from Locality **30**, Lower Cambrian limestones near Pioche, Nevada. U. S. Nat. Mus. Cat. No. 51452a. Copied from Walcott [1908c, Pl. I, figs. 1b and 1a, respectively.] The figures were there wrongly placed as the posterior and side views of the specimen represented by figure 1r of this plate. The latter specimen occurs in British Columbia; the one represented by figures 1d and 1e occurs in Nevada.

1f. Posterior view of the dorsal valve represented in figure 1b, showing the characters described in the text (see p. 362). U. S. Nat. Mus. Cat. No. 51445b.

1g. Drawing of the type specimen of the species. Locality **31a**, Lower Cambrian siliceous shale near Pioche, Nevada. U. S. Nat. Mus. Cat. No. 15331a. Specimen figured by White [1877, Pl. I, figs. 4a and 4b] as *Trematis pannula;* and by Walcott [1886b, Pl. VII, figs. 3 and 3a; and 1891a, Pl. LXIX, fig. 5d] as *Kutorgina pannula*. The surface is enlarged in figure 1o of this plate.

1h and 1i. Apical and posterior views of a dorsal (?) valve from Locality **73a**, Middle Cambrian "Tonto" sandstone, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 51447a. The surface is enlarged in figure 1n of this plate.

1j and 1 l. Apical and side views of a small specimen from Locality **31a**, Lower Cambrian limestone near Pioche, Nevada. U. S. Nat. Mus. Cat. No. 15333a. Specimen figured by Walcott [1886b, Pl. VIII, figs. 2 and 2a; 1891a, Pl. LXIX, figs. 5 and 5a] as *Kutorgina pannula*.

1k. Dorsal valve from same locality as the specimens represented by figures 1j and 1 l. U. S. Nat. Mus. Cat. No. 15333b. Specimen figured by Walcott [1886b, Pl. VIII, figs. 2b and 2c; 1887, Pl. I, fig. 14b; and 1891a, Pl. LXIX, figs. 5b and 5e] as *Kutorgina pannula*. The outer surface is enlarged in figure 1p of this plate.

1m. Ventral valve from Locality **38a**, Lower Cambrian limestones near North Granville, Washington County, New York. U. S. Nat. Mus. Cat. No. 17442a. Specimen figured by Walcott [1887, Pl. I, figs. 14 and 14a; and 1891a, Pl. LXIX, figs. 5c and 5f] as *Kutorgina pannula*. The outer surface is enlarged in figure 1q of this plate.

1n. Enlargement of a portion of the outer surface of the specimen represented by figure 1h.

1o. Enlargement of a portion of the outer surface of the type specimen, figure 1g.

1p. Enlargement of a portion of the outer surface of the specimen represented by figure 1k. Figured by Walcott [1891a, Pl. LXIX, fig. 5e] as the surface of the specimen represented by figure 1m; and [1887, Pl. I, fig. 14b; and 1886b, Pl. VIII, fig. 2c] as the outer surface of 1k.

1q. Enlargement of a portion of the outer surface of the dorsal valve represented by figure 1m. Figured by Walcott [1891a, Pl. LXIX, fig. 5f] as the surface of the valve represented by figure 1k; and [1887, Pl. I, fig. 14a] as the outer surface of 1m.

1r. Ventral valve from Locality **14s**, Middle Cambrian *Ogygopsis* zone on Mount Stephen, British Columbia. Coll. Mr. Byron E. Walker, Toronto, Canada. Copied from Walcott [1908c, Pl. I, fig. 1]; see note under figures 1d and 1e.

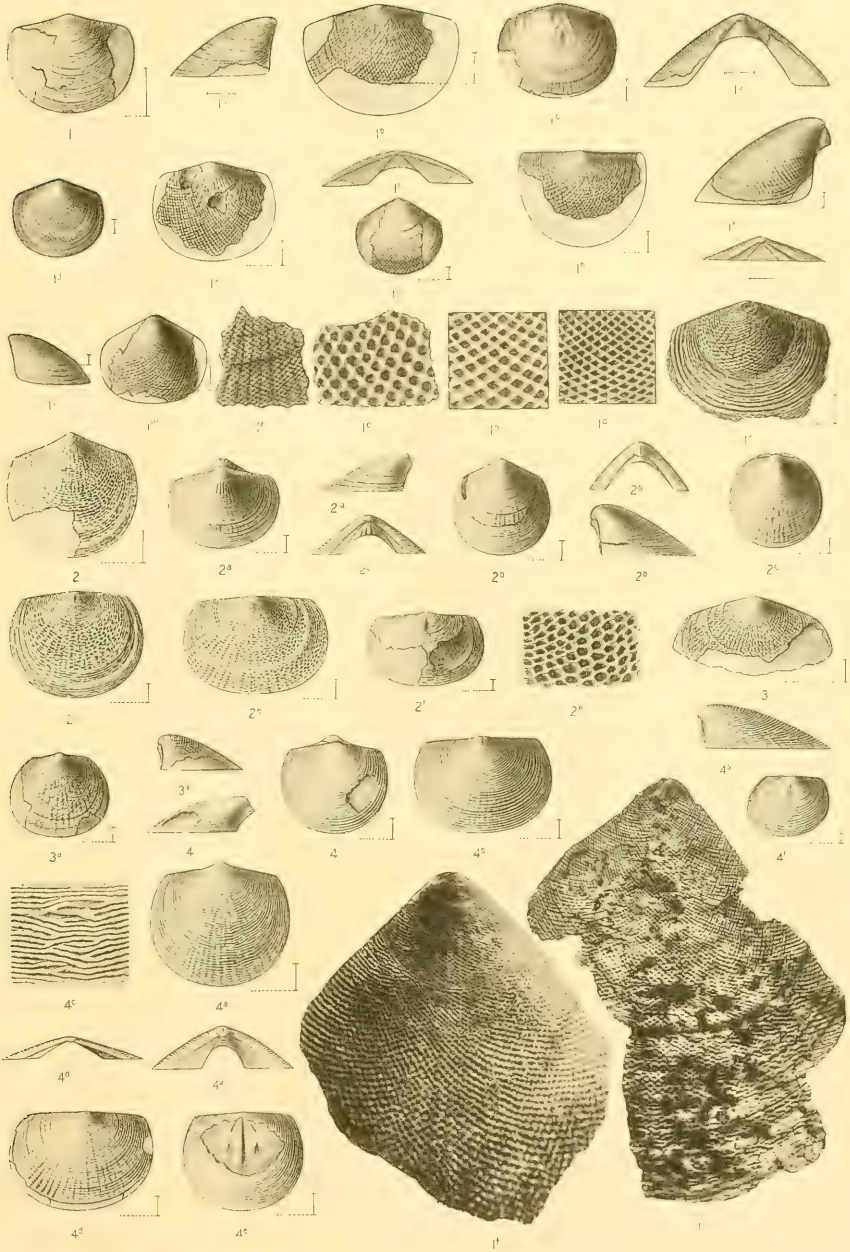
1s. Enlargement by photography of a ventral valve from Locality **74**, Middle Cambrian "Tonto" sandstone, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 51446b.

1t. Enlargement by photography of a ventral valve from Locality **149a**, Middle Cambrian limestones on Pole Creek, Madison County, Montana. U. S. Nat. Mus. Cat. No. 51445a.

MICROMITRA (IPHIDELLA) PANNULA MALADENSIS (Walcott) (p. 364).

FIGURE 2. Exterior of ventral valve from Locality **5b**, Middle Cambrian limestone, 2 miles southeast of Malade, Idaho, showing pitting of surface, and obscure, radiating ridges. U. S. Nat. Mus. Cat. No. 51468a.

2a. Apical view of ventral valve associated with valve represented by figure 2. U. S. Nat. Mus. Cat. No. 51468b.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

MICROMITRA (IPHIDELLA) PANNULA MALADENSIS (Walcott)—Continued.

FIGURES 2a′ and 2a″. Side and back views of specimen represented by figure 2a, illustrating the area and pseudodeltidium.

2b, 2b′, and 2b″. Apical, back, and side views of an elevated ventral valve from Locality **6g**, Middle Cambrian limestone, Chapple Arm, Trinity Bay, Newfoundland. U. S. Nat. Mus. Cat. No. ~~51496a~~. 51469a

2c. Apical view of an elevated, laterally compressed ventral valve associated with the valve represented by figure 2b. U. S. Nat. Mus. Cat. No. 51469b.

2d and 2e. Exterior of two dorsal valves from Locality **5b**, Middle Cambrian limestone, 2 miles southeast of Malade, Idaho, with the same type of surface as the specimen represented by figure 2. U. S. Nat. Mus. Cat. Nos. 51468c and 51468d, respectively. Figure 2e represents the type specimen.

2f. Partly exfoliated, transverse dorsal valve from locality **6g**, Middle Cambrian limestone, Chapple Arm, Trinity Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51469c.

2g. Enlargement of a portion of the surface near the center of a ventral valve from Locality **5b**, Middle Cambrian limestone, 2 miles southeast of Malade, Idaho, that has (on its frontal portion) a surface like that represented by figure 4c of the variety *ophirensis*. U. S. Nat. Mus. Cat. No. 51468e.

MICROMITRA (IPHIDELLA) PANNULA (White) (p. 361).

[Text fig. 32, p. 362, and Pl. IV, figs. 1, 1a–t.]

FIGURE 3. Posterior portion of a ventral valve having a very fine surface of the type represented by figure 1q.

3a and 3a′. Apical and side views of a ventral valve associated with the specimen represented by figure 3.

The specimens represented are both from Locality **14**, Middle Cambrian limestone, 7 miles southwest of Rome, Floyd County, Georgia. U. S. Nat. Mus. Cat. Nos. 51444a and 51444b, respectively.

MICROMITRA (IPHIDELLA) PANNULA OPHIRENSIS (Walcott) (p. 365).

FIGURES 4 and 4′. Apical and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 51464a.

4a, 4a′, and 4a″. Apical, back, and side views of a ventral valve, the type specimen, in which the beak slightly overhangs the posterior margin. U. S. Nat. Mus. Cat. No. 51464b. (See fig. 4c.)

4b. Exterior of a dorsal valve with very fine, undulating, concentric striæ. U. S. Nat. Mus. Cat. No. 51464c.

4c. Enlargement of a portion of the specimen represented by figure 4a, to illustrate irregular and inosculating striæ. U. S. Nat. Mus. Cat. No. 51464b.

4d and 4d′. Top and back views of a transverse dorsal valve. U. S. Nat. Mus. Cat. No. 51464d.

4e. Partly exfoliated dorsal valve, showing the cast of a median septum and the position of the central muscle scars. U. S. Nat. Mus. Cat. No. 51464e.

4f. A small, convex dorsal valve. U. S. Nat. Mus. Cat. No. 51464f.

The specimens represented are all from Locality **3e**, Middle Cambrian limestone, Oquirrh Range, near Ophir, Utah.

PLATE V.

PLATE V.

a. Pseudo-area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle opening.
s. Median septum.
v. Visceral area.
vs. Main vascular sinus.

Kutorgina cingulata (Billings) (p. 580).

[Text figs. 3, p. 299, 8, p. 299, and 50A–C, p. 581.]

Figure 1. Top and side view of a partly exfoliated ventral valve from Locality **25a**, Lower Cambrian limestone, 2 miles east of Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15337a. Specimen figured by Walcott [1886b, Pl. IX, fig. 1d; and 1891a, Pl. LXIX, fig. 1d].

1a. Side view of the two valves united, from Locality **25a**, near Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15337b. Specimen figured by Walcott [1886b, Pl. IX, fig. 1c; and 1891a, Pl. LXIX, fig. 1c].

1b 1c, and 1d. Side, ventral, and dorsal views of a nearly entire shell, natural size, from Locality **25a**, near Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15337d. Specimen figured by Walcott [1886b, Pl. IX, figs. 1, 1a–b; and 1891a, Pl. LXIX, figs. 1, 1a–b].

1e and 1f. Side and dorsal views of a younger shell than that represented by figures 1b, 1c, and 1d, but from the same locality. U. S. Nat. Mus. Cat. No. 15336a.

1g. Exfoliated dorsal valve, showing central muscle scars and radiating vascular canals. From Locality **392a**, Lower Cambrian limestones at L'Anse au Loup, Labrador. U. S. Nat. Mus. Cat. No. 14893a.

1h. Interior of a dorsal valve from Locality **25a**, Lower Cambrian limestone, 2 miles east of Swanton, Vermont, showing muscle scars and vascular canals. U. S. Nat. Mus. Cat. No. 15337c. Specimen figured by Walcott [1886b, Pl. IX, fig. 1f; and 1891a, Pl. LXIX, fig. 1f].

1i. Exterior of a dorsal valve from Locality **25a**, Lower Cambrian, 2 miles east of Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15337f. Specimen figured by Walcott [1886b, Pl. IX, fig. 1e; and 1891a, Pl. LXIX, fig. 1e].

1j. Exterior and side views of a fine ventral valve from Locality **2o**, Lower Cambrian limestone, Bic Harbor, Province of Quebec, Canada. U. S. Nat. Mus. Cat. No. 51510a.

1k and 1k′. View of area and side view of a ventral valve from Bic Harbor (Locality **2o**). U. S. Nat. Mus. Cat. No. 51510b.

1l and 1m. Exterior views of two dorsal valves from Bic Harbor (Locality **2o**). U. S. Nat. Mus. Cat. Nos. 51510c and 51510d, respectively.

1n. View of pseudo-area beneath apex of an elevated ventral valve from Locality **25a**, Lower Cambrian limestone, 2 miles east of Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15336b.

1o. Transverse section of the two valves in natural position, from Swanton, Vermont (Locality **25a**). The gaping pedicle opening is well shown. U. S. Nat. Mus. Cat. No. 15336c.

1p. Enlargement of a cross section of a fragment of the shell from Locality **25a**, Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15337e.

1q. Enlargement of a longitudinal section of the shell at the apex of the ventral valve. Locality **25a**, Lower Cambrian, 2 miles east of Swanton, Vermont. U. S. Nat. Mus. Cat. No. 15336d.

1r and 1s. Exterior of ventral and dorsal valves from Locality **392a**, Lower Cambrian limestone at L'Anse au Loup, Straits of Belleisle, Labrador, Canada. U. S. Nat. Mus. Cat. Nos. 14893b and 14893c, respectively.

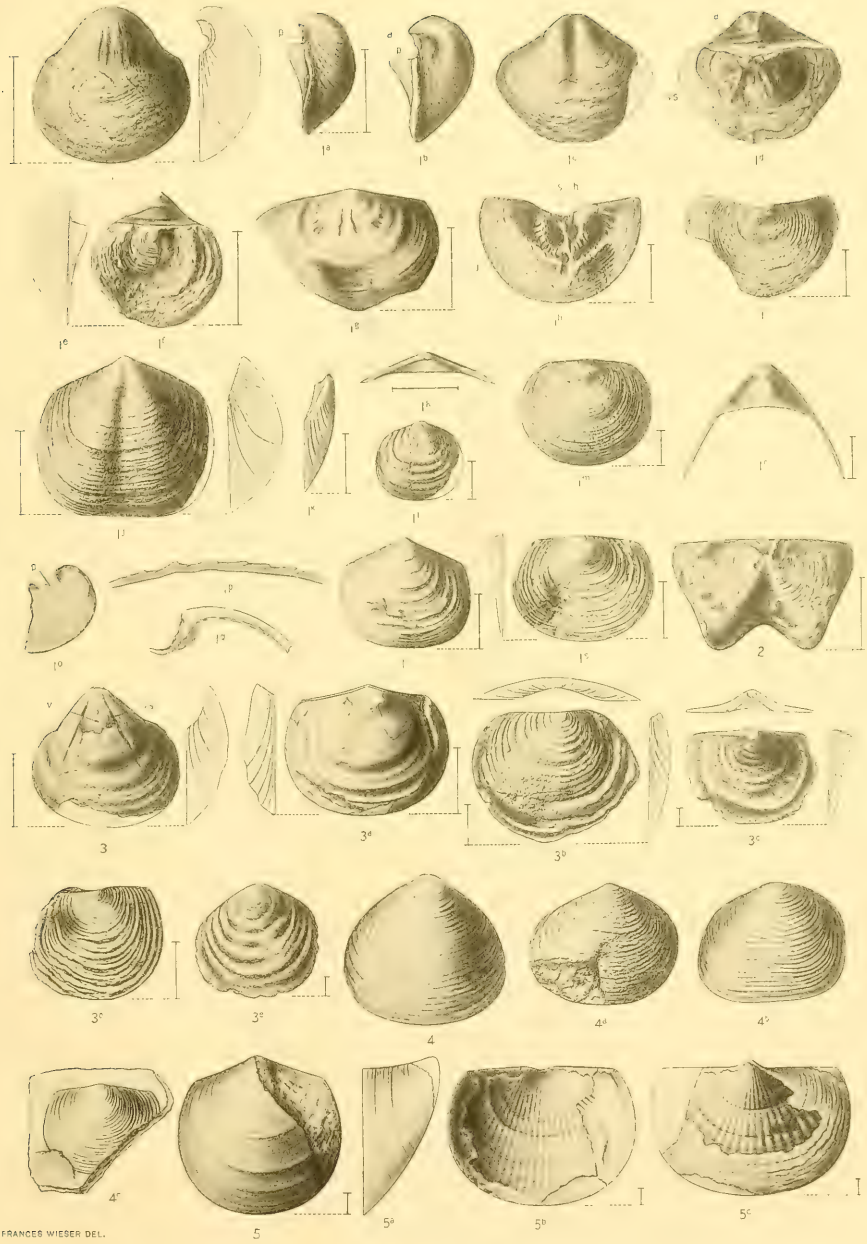
Kutorgina peculiaris (Tate) (p. 583).

Figure 2. Top view of type specimen, a dorsal valve, from Locality **315a**, Middle? Cambrian, at Ardrossan, Yorke Peninsula, South Australia. Original in the collection of the University of Adelaide, Adelaide, South Australia. Cast in the United States National Museum (Cat. No. 58300). Specimen figured by Tate [1892, Pl. II, fig. 5] as *Orthis (?) peculiaris*.

Kutorgina perugata Walcott (p. 583).

Figure 3. Exterior and side view of an exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51511a. The outline of the visceral area is drawn from another specimen. U. S. Nat. Mus. Cat. No. 51511g.

3a. Top and side views of a less elongate ventral valve than that represented by figure 3. U. S. Nat. Mus. Cat. No. 51511b.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON.

KUTORGINA PERUGATA Walcott—Continued.

FIGURE 3b. Exterior, side, and back views of a dorsal valve. The pseudo-area is broken away. U. S. Nat. Mus. Cat. No. 51511c.

3c. Top, back, and side views of an exfoliated dorsal valve, the type specimen, showing pseudo-area. U. S. Nat. Mus. Cat. No. 51511d.

3d. Exterior of dorsal valve illustrating variation in the concentric corrugations. U. S. Nat. Mus. Cat. No. 51511e.

3e. Small, strongly corrugated ventral valve, drawn from the cast of a natural mold. U. S. Nat. Mus. Cat. No. 51511f.

The specimens represented are all from Locality **1v**, Lower Cambrian, Silver Peak quadrangle (U. S. Geol. Survey), Nevada.

KUTORGINA SARDINIAENSIS Walcott (p. 584).

FIGURE 4. Ventral valve, the type specimen, from Locality **354e**, Middle ? Cambrian, Sardinia. Copied from Bornemann [1891, Pl. XIX, fig. 21], who describes and figures the specimen as *Lingula roualti*.

4a. Exterior of ventral valve from Locality **354e**, Middle ? Cambrian shale at Porto Canal Grande, Sardinia. U. S. Nat. Mus. Cat. No. 18301a.

4b and 4c. Exteriors of dorsal valves from Locality **354e**, Middle ? Cambrian, Sardinia. Copied from Bornemann [1891, Pl. XIX, figs. 22 and 23, respectively], who describes and figures them as *Kutorgina cingulata*.

KUTORGINA GRANULATA Matthew (p. 582).

FIGURES 5 and 5a. Top and side views of a broken ventral valve. Type specimen figured by Matthew [1899a, Pl. I, fig. 2a]; it is redrawn on this plate.

5b. Partly exfoliated interior of a dorsal valve. Specimen figured by Matthew [1899a, Pl. I, fig. 2c]; it is redrawn on this plate.

5c. Partly exfoliated exterior of a dorsal valve. Specimen figured by Matthew [1899a, Pl. I, fig. 2b]; it is redrawn on this plate.

The specimens represented are all from Locality **314b**, Lower Cambrian limestone, Smith Sound, Newfoundland, and are in the collection of the University of Toronto, Canada.

PLATE VI.

PLATE VI.

Mickwitzia monilifera (Linnarsson) (p. 330).

[Pl. LIX, fig. 2.]

Figures 1, 1′, and 1″. Top, side, and back views of a partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51520a.

1a. Top and side views of a small ventral valve. U. S. Nat. Mus. Cat. No. 51520b.

1b. Exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 51520c.

1c. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51520d.

1d. Interior of a dorsal valve, showing a trace of the path of advance of the posterior lateral muscle scars. U. S. Nat. Mus. Cat. No. 51520e.

1e. Posterior view of a dorsal valve, showing the arching of the margin. The apex of the valve is broken away. U. S. Nat. Mus. Cat. No. 51520f.

1f. Interior of a worn dorsal valve, showing indications of a median depression and the path of advance of the posterior lateral scars. U. S. Nat. Mus. Cat. No. 51520g.

1g, 1h, 1i, and 1j. Ventral, dorsal, side, and back views of a cast of the two valves, the dorsal valve having been crushed inward. U. S. Nat. Mus. Cat. No. 23893a.

1k. Surface of an inner lamellation or layer of shell magnified six times. U. S. Nat. Mus. Cat. No. 51520h.

1l. Surface of an inner layer of shell magnified about five times. This is a character illustrated by Linnarsson [1896b, Pl. XI, fig. 2]. U. S. Nat. Mus. Cat. No. 51520i.

1m. Exterior layer of shell, partly worn so as to show sections of the papillæ and punctæ. The papillæ when unworn are elevated and have a minute opening at the apex (see fig. 1n). U. S. Nat. Mus. Cat. No. 51520j.

1n. Exterior papillose surface of a shell, greatly magnified. U. S. Nat. Mus. Cat. No. 51520k.

The specimens represented by figures 1, 1a–n are all from Locality **390j**, Lower Cambrian *Eophyton* sandstone at Lugnås, Province of Skaraborg, Sweden.

Figures 1o and 1p. Side and back views of a cast of a compressed and somewhat distorted ventral valve from Locality **396r**, Lower Cambrian, at Streitberg, near Reval, Esthonia, Russia. Copied from Schmidt, 1888, Pl. II, figures 12c and 12d, respectively.

Mickwitzia pretiosa Walcott (p. 332).

Figure 2. Top view of the type specimen from Locality **390j**, Lower Cambrian *Eophyton* sandstone at Lugnås, Province of Skaraborg, Sweden. U. S. Nat. Mus. Cat. No. 51523a. Copied from Walcott [1908d, Pl. VII, fig. 2].

Mickwitzia formosa (Wiman) (p. 329).

Figures 3, 3a, and 3b. Top, side, and posterior views of the type specimen from Locality **311 l**, Middle? Cambrian, sandstone on the peninsula of Biludden, Gefle Bay, Sweden. Original in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 58299).

3c. Enlargement of a portion of the surface of one of the inner layers of the shell represented in figure 3, the epidermal layer having probably been exfoliated.

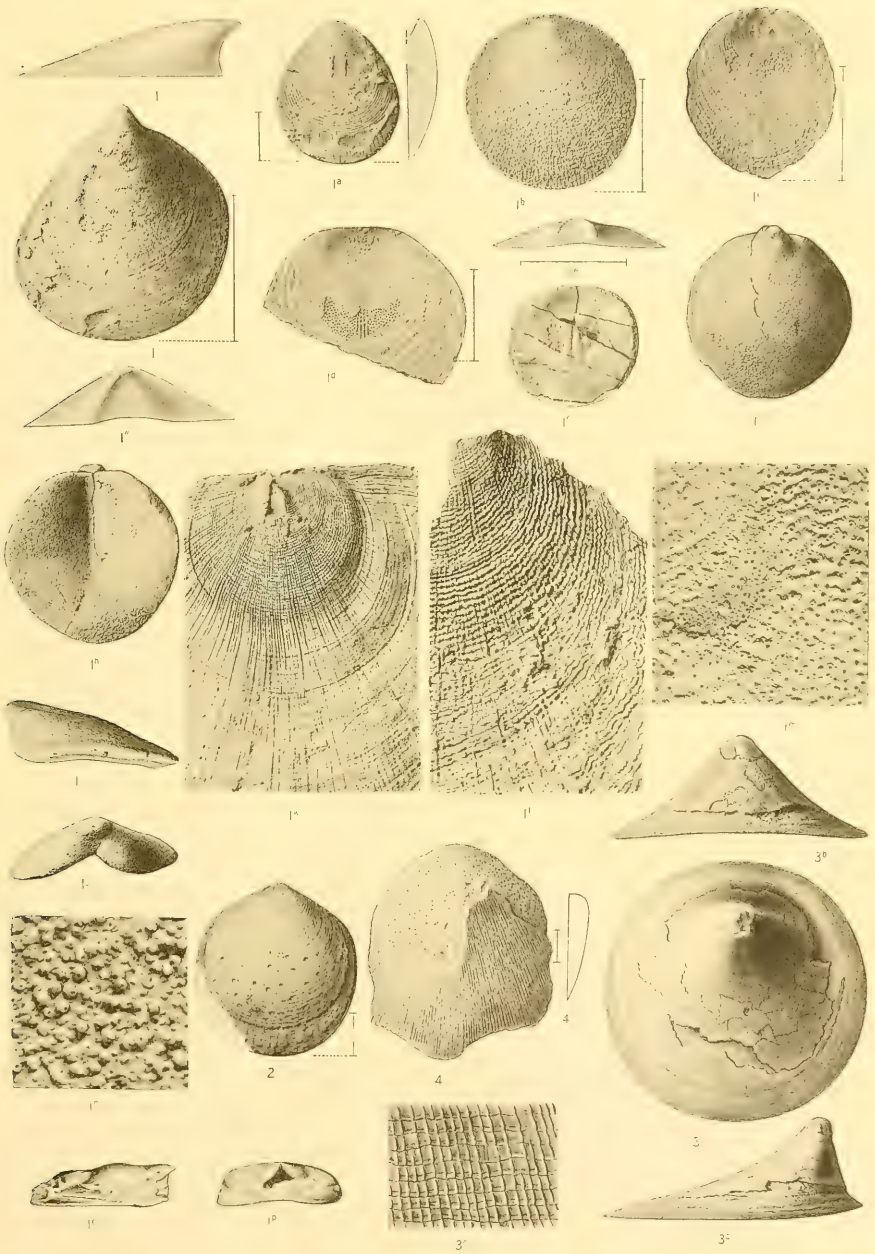
The specimen represented was figured by Wiman [1902, Pl. II, figs. 1–5] as *Causea formosa*.

Mickwitzia occidens Walcott (p. 331).

Figure 4. Type specimen, from Locality **174c**, Lower Cambrian shale, Silver Peak quadrangle (U. S. Geol. Survey), Nevada, showing outer and inner surfaces of the outer layer. U. S. Nat. Mus. Cat. No. 51518a.

4′. Side outline of specimen represented by figure 4.

Figures 4 and 4′ are copied from Walcott [1908d, Pl. VII, figs. 1 and 1′].



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON.

PLATE VII.

PLATE VII.

a. Central lateral space of area.
a′. Outer lateral space of area.
f. Flexure line of area.
g. Umbonal muscle scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
vs. Main vascular sinus.
x. Heart-shaped cavity.
x′. A slight depression of the bottom of the heart-shaped cavity.

Obolus apollinis Eichwald (p. 381).

[Text figs. 4, p. 299, and 15. p. 299, and Pl. XIV, figs. 6, 6a.]

Figures 1–6. Interiors of ventral valves illustrating variations in size, form, and position of the central, middle lateral, and outside lateral muscle scars. From Locality **9d**, Upper Cambrian *Obolus* sandstone, at Jaggowal, east of Reval, Esthonia, Russia. U. S. Nat. Mus. Cat. Nos. 51524a–f, respectively.

7 and 8. Interiors of ventral valves from Locality **395b**, Upper Cambrian *Obolus* sandstone, at Ilgast, Esthonia, Russia, showing variation in form and arrangement of the muscle scars, central depression, etc. U. S. Nat. Mus. Cat. Nos. 51525a and 51525b, respectively.

10, 11, and 12. Interiors of ventral valves from Locality **9d**, Upper Cambrian *Obolus* sandstone, at Jaggowal, Esthonia, Russia, showing variation in the form and arrangement of the muscle scars, central depression, etc. U. S. Nat. Mus. Cat. Nos. 35238a, 35238b, and 35238c, respectively. Specimens figured by Walcott [1898b, Pl. XXVI, figs. 3–5, respectively].

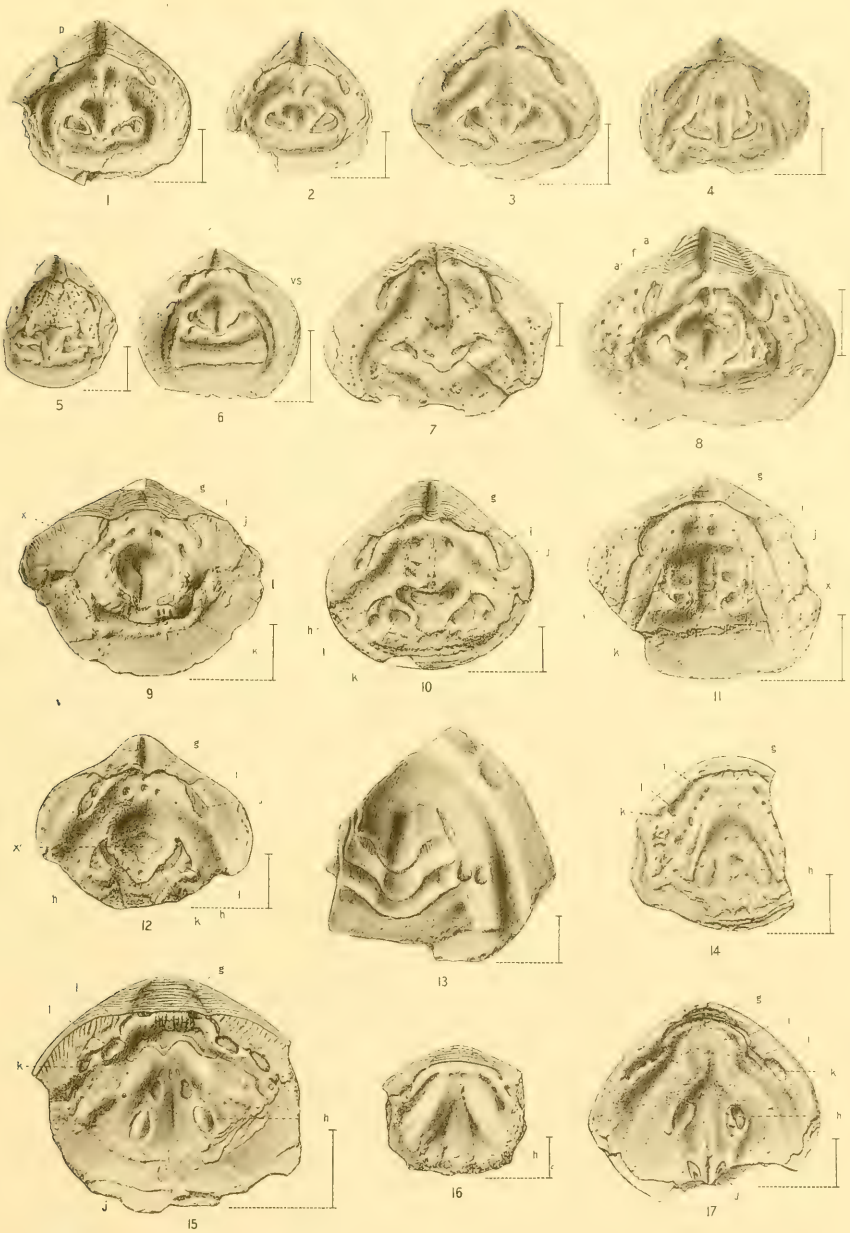
13. Fragment of the interior of a ventral valve from Locality **9d**, Upper Cambrian *Obolus* sandstone, at Jaggowal, Esthonia, Russia, in which the heart-shaped cavity is nearly lost, and in which the centrals, middle laterals, and outside laterals are crowded into a narrow space. The drawing of the central and outside lateral scars is somewhat conventionalized. U. S. Nat. Mus. Cat. No. 35238d. Specimen figured by Walcott [1898b, Pl. XXVI, fig. 6].

14, 15, 16, and 17. Interiors and posterior portions of dorsal valves from Locality **395b**, Upper Cambrian *Obolus* sandstone, at Ilgast, Esthonia, Russia, showing the variation in position of muscle scars. U. S. Nat. Mus. Cat. Nos. 51525c–f, respectively.

Obolus apollinis maximus Mickwitz (p. 384).

[Pl. XIV, figs. 7 and 7a.]

Figure 9. Interior of a ventral valve in which the thickening of the shell is very great. From Locality **395**, Upper Cambrian *Obolus* sandstone, at Joa, near Jegelecht, Esthonia, Russia. U. S. Nat. Mus. Cat. No. 51528a.



FRANCES WIESER DEL.

PLATE VIII.

PLATE VIII.

a. Central lateral space of area.
a′. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
o′. Overlapping of lines of growth of area.
p. Pedicle groove.
pvs. Peripheral branches of the vascular system.
ps. Parietal band.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
ivs. Lateral branches of vascular system.
x. Heart-shaped cavity.

Obolus matinalis (Hall) (p. 400).

Figure 1. Exterior of an almost perfect ventral valve from Locality **328e**, a Middle Cambrian horizon in the "St. Croix sandstone," St. Croix Falls, Wisconsin. U. S. Nat. Mus. Cat. No. 51564a.

1a. Large, partly exfoliated ventral valve from Locality **67c**, Upper Cambrian sandstone, Tatur Hill, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 52420a.

1b. Partly exfoliated ventral valve from Locality **67**, Upper Cambrian sandstone, Tatur Hill, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 52419a.

1c. Partly exfoliated ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 51564b.

1d. Cast of the interior of a ventral valve showing the details of the interior of the shell with unusual clearness, from Locality **82b**, Upper Cambrian "St. Croix sandstone," Taylors Falls, Chisago County, Minnesota. U. S. Nat. Mus. Cat. No. 51563a.

1e. Cast of the interior of a ventral valve associated with the valve represented by figure 1. U. S. Nat. Mus. Cat. No. 51564c.

1f. Interior of a broken ventral valve from Locality **339d**, Upper Cambrian "St. Croix sandstone" at Taylors Falls, Minnesota, showing the thickened shell under the visceral area. U. S. Nat. Mus. Cat. No. 51563c.

1g. Interior of a ventral valve, in which there is no special thickening beneath the visceral area, associated with the specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 51563d.

1h. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 51563b.

1i. Cast of the interior of a dorsal valve associated with the valve represented by figures 1, 1c, and 1e. U. S. Nat. Mus. Cat. No. 51564d.

1j. Interior of a ventral valve in which there has been a considerable thickening of the shell so as to form a platform to which the muscles and visceral parts were attached. From Locality **339d**, Upper Cambrian "St. Croix sandstone," Taylors Falls, Minnesota. U. S. Nat. Mus. Cat. No. 51563e.

1k. Partly exfoliated dorsal valve from Locality **71**, Upper Cambrian limestone, Cold Creek Canyon, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 51566a.

Obolus tetonensis ninus Walcott (p. 418).

[Pl. XI, figs. 1, 1a–g.]

Figure 1 l. Ventral valve, showing the strongly marked radiating striæ of the inner layers.

1m. Cast of the interior of a ventral valve.

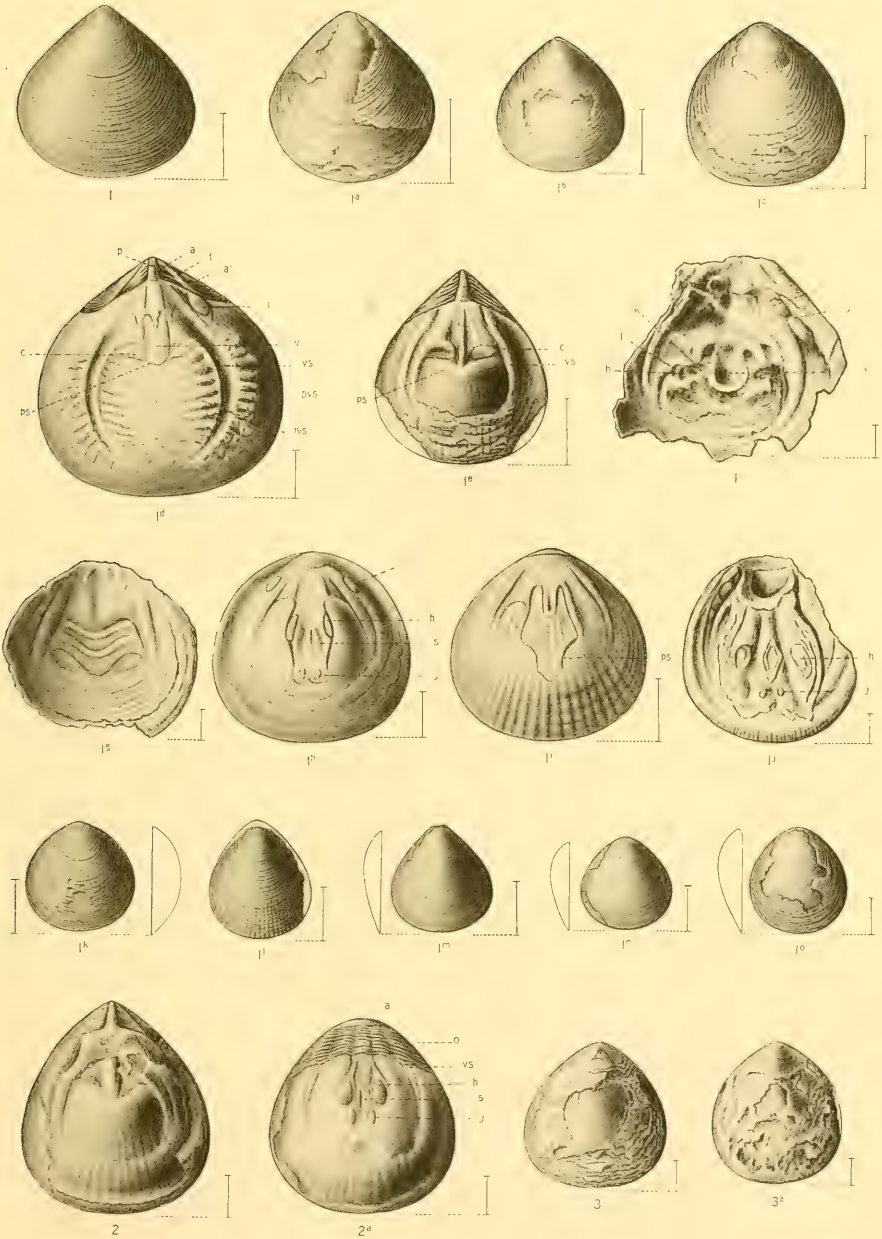
1n. Cast of the interior of a dorsal valve.

1o. Cast of the interior of a partly exfoliated dorsal valve.

The specimens represented by figures 1l to 1o are from Locality **68**, Upper Cambrian sandstone, Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. Nos. 51644a–d, respectively.

Obolus namouna Walcott (p. 406).

Figure 2. Cast of the interior of a ventral valve, the type specimen, associated on the same hand specimen with the shells of *Obolus rhea* represented by figures 1a and 1b, Plate IX, from Locality **98**, Upper Cambrian "St. Croix sandstone," Eau Claire, Wisconsin. U. S. Nat. Mus. Cat. No. 27304a.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

OBOLUS NAMOUNA Walcott—Continued.

FIGURE 2a. Cast of the interior of a dorsal valve associated on the same hand specimen with the specimen represented by figure 2. The remarkable feature of this specimen is the continuation of the lines of growth of the area far forward on the shell. U. S. Nat. Mus. Cat. No. 27304b.

OBOLUS MATINALIS (Hall)? Walcott (p. 402).

FIGURES 3 and 3a. Ventral and dorsal valves of partly exfoliated shells from Locality **C54**, Upper Cambrian Chaumitien limestone, two-thirds mile west of Tsinan, Shantung, China. U. S. Nat. Mus. Cat. Nos. 52533a and 52533b, respectively.

PLATE IX.

PLATE IX.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
ps. Parietal band.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Obolus rhea Walcott (p. 410).

Figure 1. Cast of the interior of a ventral valve, the type specimen, from Locality **98**, Upper Cambrian "St. Croix sandstone," Eau Claire, Wisconsin, which shows the median, pestle-shaped ridge that filled the corresponding groove on the interior of the shell. Casts of the lines of growth and the visceral area are also finely preserved. U. S. Nat. Mus. Cat. No. 27300a.

1a. Cast of the interior of a ventral valve from Locality **98**, Upper Cambrian "St. Croix sandstone," Eau Claire, Wisconsin, in which some of the details of the anterior part of the visceral cavity are more clearly defined than in the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 27300b.

1b. A dorsal valve, associated on the same hand specimen with the specimen represented by figure 1a, from which the shell has been almost wholly exfoliated. U. S. Nat. Mus. Cat. No. 27300c.

The specimens represented in figures 1a and 1b are on the same slab of sandstone as the two specimens of *Obolus namouna* represented by figures 2 and 2a, Plate VIII.

Figure 1c. Cast of the interior of a dorsal valve from Locality **84**, a Middle Cambrian horizon in the "St. Croix sandstone," Dresbach, Minnesota, showing the area and traces of the vascular markings. U. S. Nat. Mus. Cat. No. 52430a.

Obolus refulgens Matthew (p. 409).

Figure 2. Cast of the interior of a ventral valve, the type specimen, that is flattened in the shale. University of Toronto, Canada. Redrawn from the specimen figured by Matthew [1892, Pl. XII, fig. 6d (ventral)] as *Obolus refulgens;* and copied by him [1903, Pl. XI, fig. 4a] as *Monobolina refulgens*.

2a. Cast of the interior of a dorsal valve that preserves the original convexity. University of Toronto, Canada. Redrawn from the specimen figured by Matthew [1892, Pl. XII, fig. 6d (dorsal)] as *Obolus refulgens;* and copied by him [1903, Pl. XI, fig. 4b] as *Monobolina refulgens*.

2b. Ventral valve flattened in the shale and compressed laterally so as to give it more the outline of *Lingulella* than of *Obolus*. University of Toronto, Canada.

2c and 2d. Dorsal valves flattened in the shale and slightly distorted. University of Toronto, Canada.

The specimens represented all occur in Locality **308**, Upper Cambrian, Division 3c of Matthew, Navy Island, St. John Harbor, New Brunswick. Specimens represented by figures 2 and 2a occur in an arenaceous shale which preserves the specimens in better condition than in the argillaceous shales.

Obolus pandemia Walcott (p. 407).

Figure 3. Exterior of a slightly flattened and distorted ventral valve. U. S. Nat. Mus. Cat. No. 27301a.

3a. Cast of the interior of a ventral valve, the type specimen, that has been compressed in its posterior portion so as to force the visceral cavity back nearly to the area. U. S. Nat. Mus. Cat. No. 27301b.

3b. Interior of the ventral valve showing an elevated pestle-shaped median ridge that occupies the place of the heart-shaped cavity of most species of *Obolus*. U. S. Nat. Mus. Cat. No. 27301c.

3c. Cast of the interior of a dorsal valve, showing the area. U. S. Nat. Mus. Cat. No. 27301d.

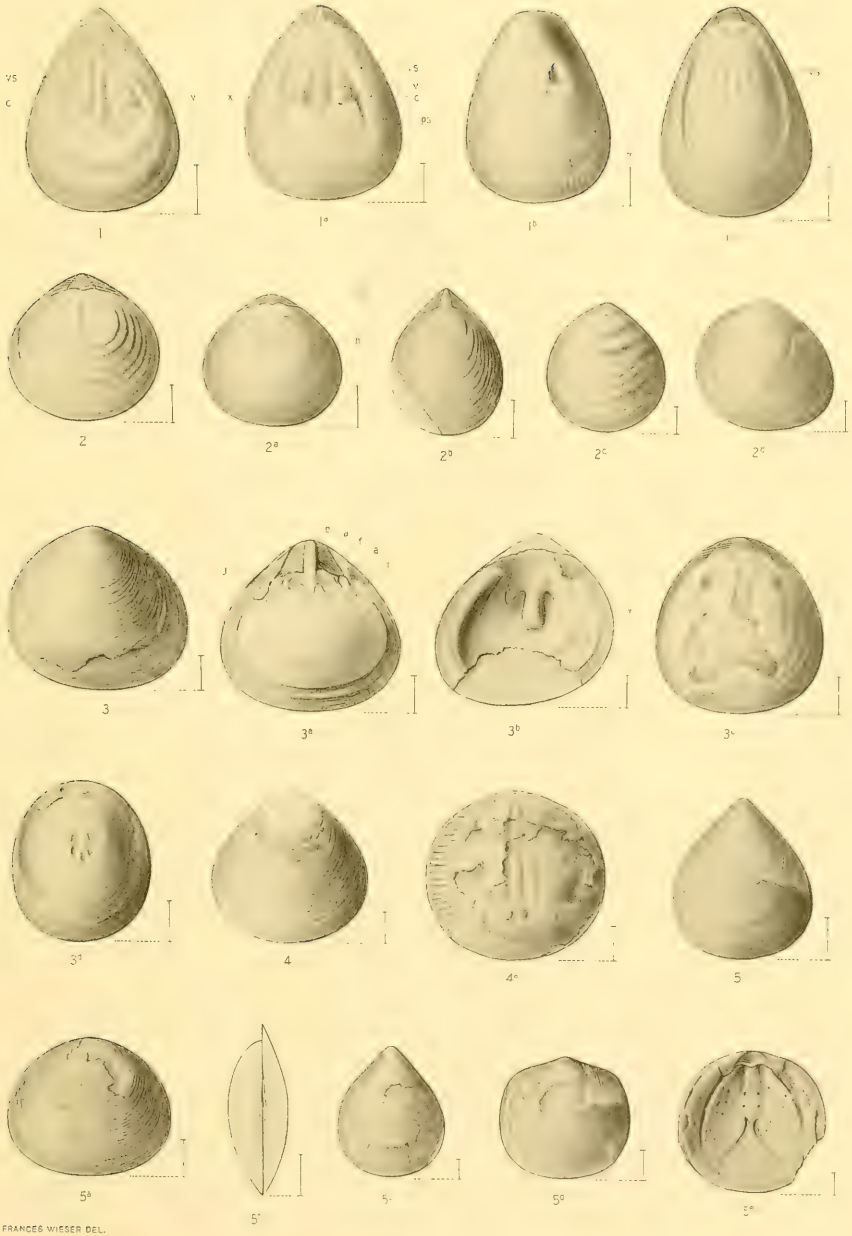
3d. Cast showing part of the interior of a dorsal valve, showing traces of the central muscle scars, and the thick lamination of the shell toward the margin. U. S. Nat. Mus. Cat. No. 27301e.

The specimens represented are all from Locality **10a**, Middle Cambrian, Bays Mountains, Knoxville, Tennessee.

Obolus loperi Walcott (p. 395).

Figure 4. Imperfect ventral valve from Locality **335a**, Cambro-Ordovician sandstone, Cement Creek, 3 miles north of Hot Springs, Ouray County, Colorado, showing the general form and the several layers forming the shell. U. S. Nat. Mus. Cat. No. 27303a.

4a. Partly exfoliated dorsal valve, the type specimen, associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 27303b.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

OBOLUS TETONENSIS Walcott (p. 417).

FIGURE 5. A ventral valve, the type specimen, with the anterior portion of the shell exfoliated, from Locality **4e**, Middle Cambrian limestone, Teton Mountains, Wyoming. U. S. Nat. Mus. Cat. No. 51639a.

5a. Dorsal valve associated with specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 51639b.

5b. Outline of the two valves, showing their convexity. Drawn from specimen associated with specimens represented by figures 5 and 5a. U. S. Nat. Mus. Cat. No. 51639c.

5c. A small ventral valve from Locality **4m**, Middle Cambrian sandstone in the Teton Mountains, Wyoming. U. S. Nat. Mus. Cat. No. 35220a.

5d. Dorsal valve associated with specimen represented by figure 5c. This shell may belong to some other species. U. S. Nat. Mus. Cat. No. 35220b.

OBOLUS WORTHENI Walcott (p. 421).

[Text figs. 39A–D, p. 421.]

FIGURE 5e. A very finely preserved interior of a small dorsal valve, the type specimen, from Locality **54u**, Middle Cambrian limestone, 2 miles southeast of Malade, Idaho. U. S. Nat. Mus. Cat. No. 51638a. Copied from Walcott [1908d, Pl. VII, fig. 17].

PLATE X.

PLATE X.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scar.
j. Anterior lateral muscle scar.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Obolus mickwitzi Walcott (p. 403).

Figure 1. Cast of a small ventral valve, the type specimen, showing the deeply impressed vascular and visceral markings. It will be noted that the visceral cavity extends far forward. U. S. Nat. Mus. Cat. No. 27299a.

1a. Cast of the interior of a ventral valve in which the visceral cavity is much larger proportionally than that represented in figure 1, and in which the areas occupied by the central, middle lateral, and outside lateral scars are unusually large and prominent. More than two-thirds of the entire length of the shell is taken up by the visceral area. U. S. Nat. Mus. Cat. No. 27299b.

1b. Portion of the cast of a small ventral valve in which the interior markings have been still more deeply impressed than in the specimens shown by figures 1 and 1a. The heart-shaped cavity (x), the trapezoidal area (c), and the main vascular sinus (vs) must have been placed upon a strongly built up platform in the interior of the shell. U. S. Nat. Mus. Cat. No. 27299c.

1c. Cast of the interior of a large ventral valve in which the visceral area is limited to the posterior half of the shell. U. S. Nat. Mus. Cat. No. 27299d.

1d. Cast of the interior of a large dorsal valve which shows the relative position of the central (h) and anterior lateral (j) muscle scars, and the form of the visceral cavity. U. S. Nat. Mus. Cat. No. 27299e.

1e. Partly exfoliated dorsal valve which illustrates the lamellated character of the shell and the strong concentric undulations of growth which appear on some specimens. U. S. Nat. Mus. Cat. No. 27299f.

1f. Cast of a large dorsal valve in which the visceral area is mainly upon the posterior half, as in the ventral valve represented by figure 1c. U. S. Nat. Mus. Cat. No. 27299g.

1g. Cast of the interior of a small dorsal valve in which the visceral area occupies the central portion of the shell. U. S. Nat. Mus. Cat. No. 27299h.

1h. Cast of the interior of a dorsal valve showing a remarkable development of the area about the central muscle scars. U. S. Nat. Mus. Cat. No. 27299i.

1i. Cast of the interior of a ventral valve in which the main vascular sinus and other interior markings of the shell are less deeply impressed than in specimens represented by figures 1a and 1b.

The specimens represented in figures 1, 1a–i are from Locality **79**, Upper Cambrian sandstone, at Hudson, Wisconsin.

Figure 1j. Cast of a ventral valve which is somewhat doubtfully referred to this species, owing to its not showing the same strong interior markings. This, however, may be the result of the condition of preservation. U. S. Nat. Mus. Cat. No. 56937a.

1k. Partly exfoliated dorsal valve associated with the specimen represented by figure 1j. It is probable that a larger collection of material would show that figures 1j and 1k represent a distinct species. U. S. Nat. Mus. Cat. No. 56937b.

The specimens represented in figures 1j and 1k are from Locality **79b**, Upper Cambrian sandstone at Hudson, Wisconsin, a slightly different horizon than the one containing the specimens represented in figures 1, 1a–i.

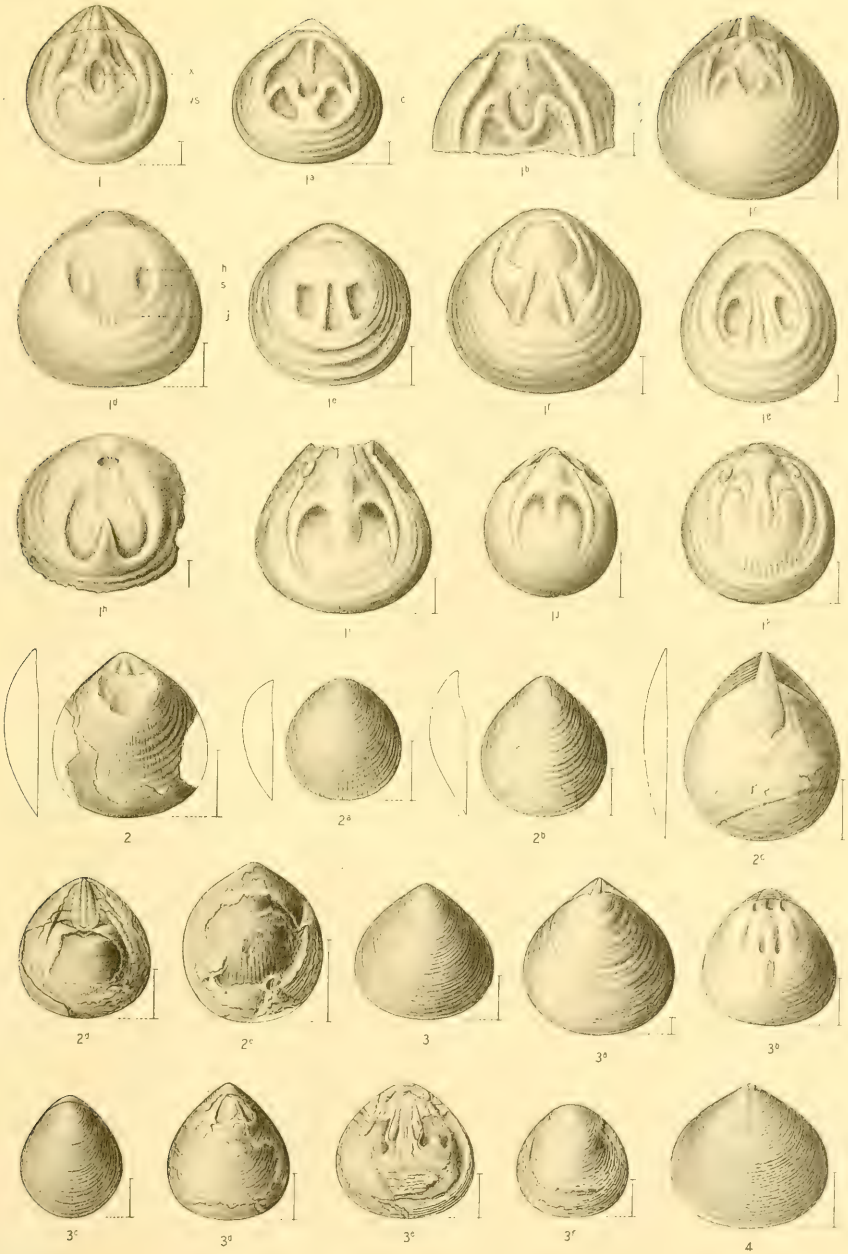
Obolus mæra (Hall and Whitfield) (p. 399).

Figure 2. Partly exfoliated and broken ventral valve from Locality **313j**, Upper Cambrian limestone, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 24552a.

2a. Partly exfoliated dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 24552b. Type specimen figured by Hall and Whitfield [1877, Pl. I, fig. 6] as *Lingulepis mæra*.

2b. More elongated, partly exfoliated dorsal valve from Locality **313j**, Upper Cambrian limestone, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 24552c. Specimen figured by Hall and Whitfield [1877, Pl. I, fig. 5] as *Lingulepis mæra*.

2c. Crushed and partly exfoliated ventral valve, doubtfully referred to this species, from Locality **205**, limestone forming passage beds between the Upper Cambrian and the Ordovician, on Roundtop Mountain, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 51562a.



FRANCES WIESER DEL.

OBOLUS MÆRA (Hall and Whitfield)—Continued.

FIGURE 2d. Exfoliated ventral valve from Locality **61**, Upper Cambrian Dunderberg shale, south of the Hamburg mine, Eureka district, Nevada, showing outline of visceral area. U. S. Nat. Mus. Cat. No. 51561a.

2e. Partly exfoliated ventral valve, showing radial striation of interior layers of the shell, Locality **58**, Middle Cambrian Secret Canyon shale, New York and Secret canyons, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 51560a.

OBOLUS ANCEPS Walcott (p. 380).

FIGURE 3. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 27302a.

3a. Partly exfoliated ventral valve showing the area. U. S. Nat. Mus. Cat. No. 27302b.

3b. Cast of the interior of a dorsal valve, the type specimen, showing the area and traces of the vascular markings. U. S. Nat. Mus. Cat. No. 27302c.

3c. More elongated dorsal valve than that represented by figure 3b. U. S. Nat. Mus. Cat. No. 27302d.

The specimens represented in figures 3, 3a–c are all from Locality **63**, Lower Ordovician Pogonip limestone, northeast of Adams Hill, Eureka district, Nevada.

FIGURE 3d. Ventral valve. U. S. Nat. Mus. Cat. No. 51541a.

3e. Partly exfoliated dorsal valve showing interior layers of the shell. U. S. Nat. Mus. Cat. No. 51541b.

3f. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 51541c.

The specimens represented in figures 3d–f are from Locality **61**, Upper Cambrian Dunderberg shale, south of the Hamburg mine, Eureka district, Nevada.

OBOLUS sp. undt. a Walcott (p. 422).

FIGURE 4. Ventral valve compressed in shaly limestone of Locality **338v**, Lower Ordovician, 1 mile southwest of Middle Granville, Washington County, New York. U. S. Nat. Mus. Cat. No. 51652a

PLATE XI.

PLATE XI.

a. Area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scar.
j. Anterior lateral muscle scar.

Obolus tetonensis ninus Walcott (p. 418).

[Pl. VIII, figs. 11-o.]

Figures 1 and 1′. Top and side views of exterior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51643a.

1a. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51643b.

1b. Interior of ventral valve, showing outline of visceral area. U. S. Nat. Mus. Cat. No. 51643c.

1c. Dorsal valve, showing lamellation of shell. U. S. Nat. Mus. Cat. No. 51643d.

1d and 1d′. Exfoliated dorsal valve, showing striation of interior layers of shell. U. S. Nat. Mus. Cat. No. 51643e.

1e and 1f. Exfoliated dorsal valves, showing character of interior layers of shell and variation in form from specimens represented by figures 1c and 1d. U. S. Nat. Mus. Cat. Nos. 51643f and 51643g, respectively.

1g. Cast of broken dorsal valve, showing anterior position of visceral area, and the central and anterior lateral scars. U. S. Nat. Mus. Cat. No. 51643h.

The specimens represented are all from Locality **9r**, Upper Cambrian limestone in the Reagan sandstone, Comanche County, Oklahoma.

Obolus (Westonia) themis Walcott (p. 466).

Figure 2. Exterior of ventral valve, the type specimen, showing broken edges of lamellæ of the shell. U. S. Nat. Mus. Cat. No. 51732a.

2a. Dorsal valve, showing the same shell characters as figure 2. U. S. Nat. Mus. Cat. No. 51732b.

2b. Broken ventral valve, showing cast of the visceral cavity and main vascular trunks. U. S. Nat. Mus. Cat. No. 51732c.

2c. Partly exfoliated dorsal valve, posterior margin broken away. U. S. Nat. Mus. Cat. No. 51732d.

The specimens represented are all from Locality **17c**, Middle Cambrian sandy limestone on Grand View trail, south side Grand Canyon of the Colorado, Arizona.

Obolus ismene Walcott (p. 393).

Figure 3. Portion of ventral valve, the type specimen, showing cardinal slopes and the striation of one of the inner layers of shell. U. S. Nat. Mus. Cat. No. 51545a.

3a. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 51545b.

3b. Interior of a dorsal valve showing area. U. S. Nat. Mus. Cat. No. 51545c.

The specimens represented are all from Locality **369**, Upper Cambrian sandstone in the Elvins formation, Flat River, St. Francois County, Missouri.

Obolus nundina Walcott (p. 406).

Figure 4. Ventral valve, the type specimen, showing the characteristic strong concentric ridges.

4a. Partly exfoliated dorsal valve.

The specimens represented are on the same piece of limestone from Locality **14b**, Upper Cambrian, Cold Creek, Llano County, Texas. U. S. Nat. Mus. Cat. Nos. 51587a and 51587b, respectively.

Obolus acadicus Walcott (p. 380).

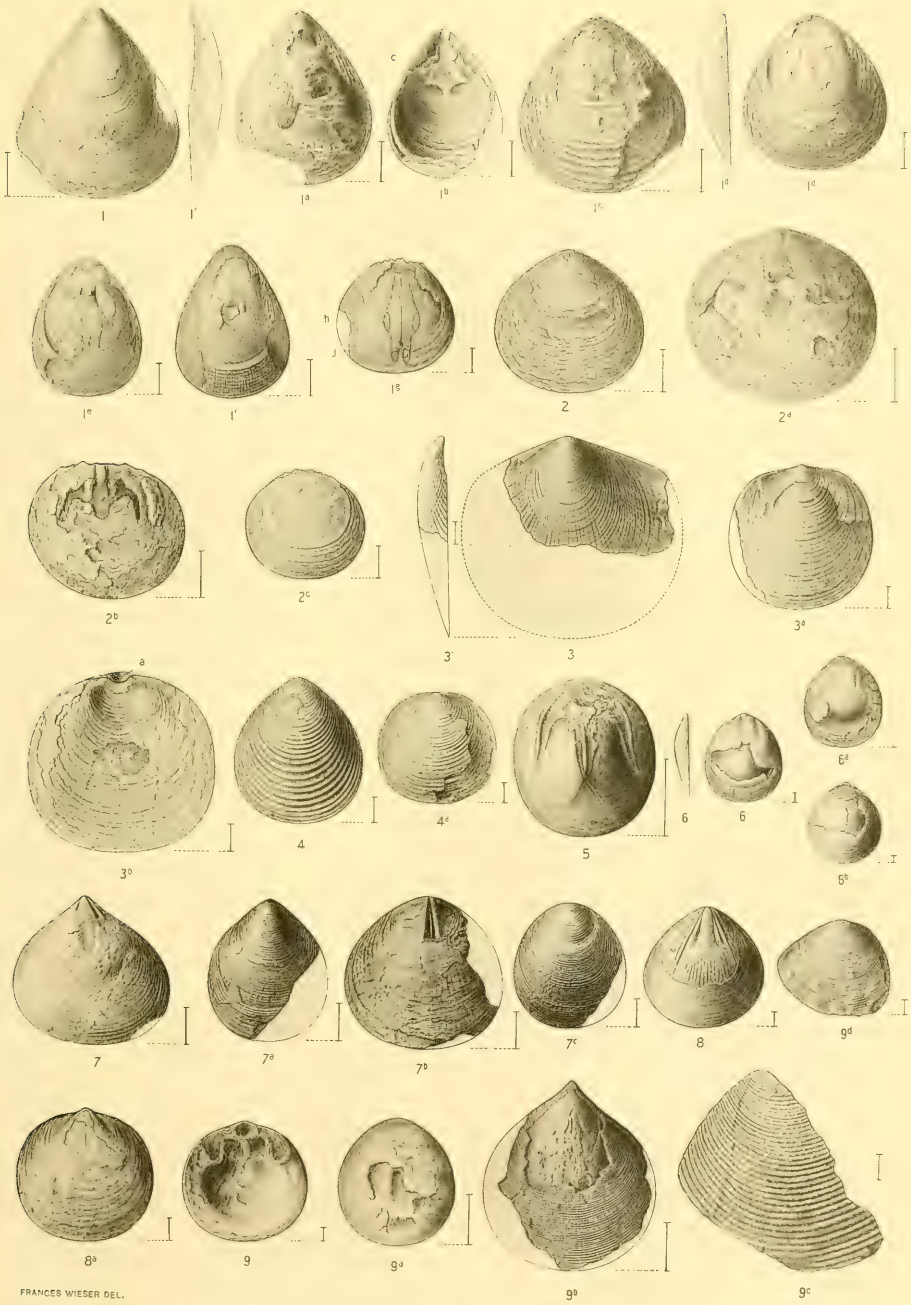
Figure 5. Cast of the interior of a dorsal valve, the type specimen, from Locality **3h**, Upper Cambrian shale, McNeil Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51540a. The posterior portion of the shell was restored from another specimen (Catalogue No. 51540b), the two being counterparts.

Obolus pheres Walcott (p. 408).

Figures 6 and 6a. Views of partly exfoliated ventral valves, showing thickness of the lamellated shell. U. S. Nat. Mus. Cat. No. 51589a and 51589b, respectively. Figure 6 represents the type specimen.

6b. Imperfect dorsal valve. U. S. Nat. Mus. Cat. No. 51589c.

The specimens represented are all from Locality **10v**, Upper Cambrian shale near Baraboo, Wisconsin.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Obolus shansiensis Walcott (p. 415).

Figure 7. Broad form of the ventral valve from Locality **C32**, Middle Cambrian river drift on the Nankiang, 1 mile south of Chonpinghien, Shensi, China. U. S. Nat. Mus. Cat. No. 52537a.

7a. Narrow form of the ventral valve, the type specimen, from Locality **C37**, Middle Cambrian Kichou limestone, 8 miles south of Tinghianghien, Shansi, China. U. S. Nat. Mus. Cat. No. 52538a.

7b. Broad form of the dorsal valve associated with the ventral valve represented by figure 7. U. S. Nat. Mus. Cat. No. 52537b.

7c. Narrow form of the dorsal valve associated with the ventral valve represented by figure 7a. U. S. Nat. Mus. Cat. No. 52538b.

Obolus minimus Walcott (p. 404).

Figure 8. A partly exfoliated ventral valve, the type specimen, showing the cast of the visceral area and the main vascular canals.

8a. Exterior of dorsal valve.

The specimens represented are both from Locality **C1**, Middle Cambrian Kiulung limestone, 2 miles south of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. Nos. 52534a and 52534b, respectively.

Obolus obscurus Walcott (p. 406).

Figure 9. Interior of an imperfectly preserved dorsal valve, the type specimen. U. S. Nat. Mus. Cat. No. 52536a.

9a. Exterior of an exfoliated, partly restored dorsal valve. U. S. Nat. Mus. Cat. No. 52536b.

The specimens represented in figures 9 and 9a are both from Locality **C63**, Middle Cambrian sandy shale at the base of the Kiulung group, 3.5 miles southwest of Yenchuang, Sintai district, Shantung, China.

Figure 9b. Partly exfoliated and broken ventral valve, showing concentric and radiating lines on the inner layers of the shell. U. S. Nat. Mus. Cat. No. 52535a.

9c. Enlargement of the concentric striæ of the exterior surface. U. S. Nat. Mus. Cat. No. 52535b.

9d. Exterior surface of a broken dorsal valve. U. S. Nat. Mus. Cat. No. 52535c.

The specimens represented in figures 9b–d are from Locality **C75**, Middle Cambrian limestone near the base of the Kichou formation, 4.5 miles south of Wutaihien, Shansi, China.

PLATE XII.

PLATE XII.

a. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
vs. Main vascular sinus.
ivs. Lateral branches of the vascular system.

Obolus feistmanteli (Barrande) (p. 391).

[Pl. XII, figs. 9 and 9a.]

Figure 1. Interior of ventral valve. Copied from Barrande [1879b, Pl. CVI, fig. IV: 7A].

1a. Cast of exterior surface of ventral valve, showing traces of concentric striæ and lines of growth. Copied from Barrande [1879b, Pl. CVI, fig. IV: 11A].

1b. Cast of interior of ventral valve. Original in the collection of the Museum of Comparative Zoology, Cambridge, Massachusetts; cast in the United States National Museum (Cat. No. 57088a).

1c. Cast of interior of ventral valve, showing lateral vascular canals. Original in the Museum of Comparative Zoology; cast in the United States National Museum (Cat. No. 57088b).

1d. Interior of the type specimen, a ventral valve. Copied from Barrande [1879b, Pl. CVI, fig. IV: 4A].

1e. Cast of the interior of a dorsal valve, showing traces of lateral vascular canals. Original in the Museum of Comparative Zoology; cast in the United States National Museum (Cat. No. 57088c). (See fig. 9a.)

1f. Enlargement of a portion of a partly exfoliated shell, showing structure of shell. Copied from Barrande [1879b, Pl. CVI, fig. IV: 12f].

The specimens represented are all from Locality **303i,** Lower Ordovician sandstone, Étage d1, Kruschna Hora, Bohemia.

Obolus? ancillus (Barrande) (p. 381).

Figure 2. Partly exfoliated ventral valve, the type specimen, from Locality **303g,** Lower Ordovician, Étage d1, Rabenberg, Bohemia. Copied from Barrande [1879b, Pl. CXI, fig. VI: 3A].

Obolus complexus Barrande (p. 387).

[Pl. XII, figs. 8 and 8a.]

Figure 3. Cast of interior of ventral valve, the type specimen, from Locality **303i,** Lower Ordovician, Étage d1, Kruschna Hora, Bohemia. Copied from Barrande [1879b, Pl. CLII, fig. II: 4A].

3a. Interior of dorsal valve from Locality **303i,** Lower Ordovician, Étage d1, Kruschna Hora, Bohemia. Copied from Barrande [1879b, Pl. CXIII, fig. V: A].

Obolus? mirandus (Barrande) (p. 405).

Figure 4. Ventral valve, the type specimen, from Locality **303k,** Lower Ordovician, Étage d1, Hradischt, Bohemia. Copied from Barrande [1879b, Pl. CXI, fig. I: 3A].

4a. Dorsal? valve from Locality **303k,** Lower Ordovician, Étage d1, Hradischt, Bohemia. Copied from Barrande [1879b, Pl. CXI, fig. I: 1A].

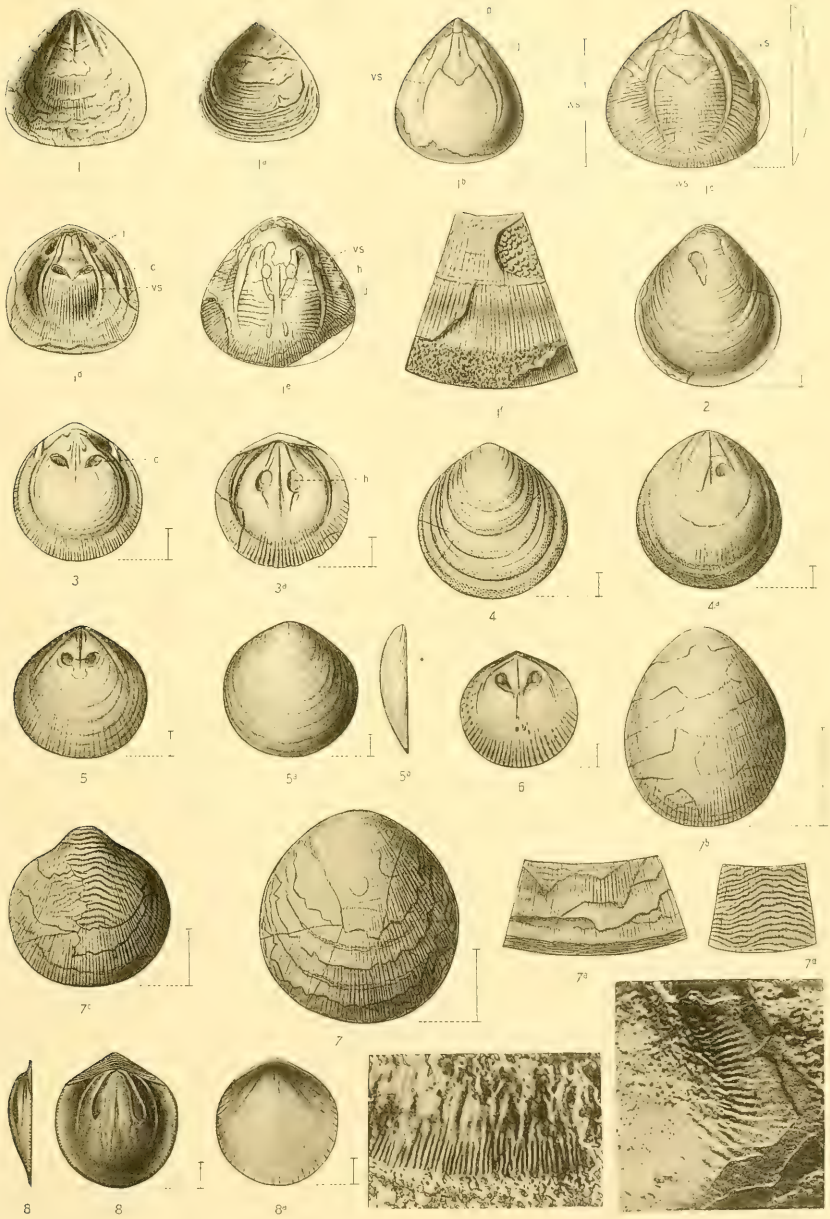
Obolus? advenus Barrande (p. 380).

Figure 5. Cast of interior of ventral valve, the type specimen, from Locality **303d,** Lower Ordovician, Étage d1, Swarow, Bohemia. Copied from Barrande [1879b, Pl. XCV, fig. IV: 2A].

5a and 5b. Exterior and side view of dorsal? valve from Locality **303d,** Lower Ordovician, Étage d1, Swarow, Bohemia. Copied from Barrande [1879b, Pl. XCV, figs. IV: 1A and 2B, respectively].

Obolus? rokitzanensis Barrande (p. 411).

Figure 6. Cast of the interior of a ventral valve, the type specimen, from Locality **303b,** Lower Ordovician, Étage d1, in the environs of Rokitzan, Bohemia, showing strong radiating striæ. Copied from Barrande [1879b, Pl. CXXVI, fig. II: 5A].



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Obolus? (Westonia?) lamellosus (Barrande) (p. 463).

Figure 7. Enlargement of a dorsal valve, the type specimen. Copied from Barrande [1879b, Pl. CVI, fig. I: 2A].
7a. Surface and lamellæ of shell greatly enlarged. Copied from Barrande [1879b, Pl. CVI, fig. I: 3f].
7b. Elongate dorsal valve. Copied from Barrande [1879b, Pl. CXI, fig. IX: 2A].
7c. Distorted ventral ? valve. Copied from Barrande [1879b, Pl. CXI, fig. IX: 1A].
7d. Enlargement of the surface of the specimen represented in figure 7c. Copied from Barrande [1879b, Pl. CXI, fig. IX: 1f].

The specimens represented are all from Locality **303 l**, Lower Ordovician, Étage d1, Libetschov, Bohemia.

Obolus complexus Barrande (p. 387).

[Pl. XII, figs. 3 and 3a.]

Figures 8 and 8′. Cast of interior and side outline of a ventral ? valve from Locality **303i**, Lower Ordovician, Étage d1, Kruschna Hora, Bohemia. Copied from Barrande [1879b, Pl. XCV, figs. III: 1A and 1B, respectively].
8a. Supposed cast of interior of dorsal valve from Locality **303h**, Lower Ordovician, Étage d1, Milinsky Wrch, near Woleschna, Bohemia. Copied from Barrande [1879b, Pl. XCV, fig. III: 2C].

Obolus feistmanteli (Barrande) (p. 391).

[Pl. XII, figs. 1, 1a–f.]

9. Cast of the inner surface of the frontal rim of the shell, greatly enlarged. Original in the Museum of Comparative Zoology; cast in the United States National Museum (Cat. No. 57088d).
9a. Traces of the minute terminal vessels that cross the inner surface near the anterolateral margins of the shell; greatly enlarged from a portion of the surface of the specimen represented by figure 1e. Original in the Museum of Comparative Zoology; cast in the United States National Museum (Cat. No. 57088c).

The specimens represented are both from Locality **303i**, Lower Ordovician sandstone, Étage d1, Kruschna Hora, Bohemia.

PLATE XIII.

PLATE XIII.

Obolus (Bröggeria) salteri (Holl) (p. 424).

[Pl. XV, figs. 4, 4a–d.]

Figure 1. Exterior of ventral valve from Locality **309i**, Upper Cambrian near Sandby, Province of Malmöhus, Sweden. U. S. Nat. Mus. Cat. No. 51673a.

1a. Ventral valve associated with the specimen represented by figure 1, showing a cast of part of the interior of the shell. U. S. Nat. Mus. Cat. No. 51673b.

1b. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 51673c.

1c. Cast of the interior of a ventral valve from Locality **3091**, Upper Cambrian, Sweden (exact locality unknown), showing the area, more or less of the main vascular sinuses, and the visceral cavity. U. S. Nat. Mus. Cat. No. 51398a.

1d. Cast of the interior of a ventral valve from Locality **101**, Upper Cambrian shales, east bank of Barachois River, 6 miles from Little Bras d'Or Lake, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51671a.

1e. Cast of the interior of a ventral valve from Locality **3q**, Upper Cambrian shales, Barachois Glen, 4 miles south of Little Bras d'Or Lake, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52441a.

1f. Cast of the interior of a dorsal valve from Locality **3091**, Upper Cambrian, Sweden (exact locality unknown). U. S. Nat. Mus. Cat. No. 51398b.

1g. Cast of exterior of a ventral valve from Locality **10i**, Upper Cambrian shales, Barachois River, north of Boisdale road, Cape Breton, Nova Scotia, with a portion of the shell covering the area broken away. U. S. Nat. Mus. Cat. No. 52442a.

1h, 1i, and 1j. Casts of dorsal valves from Locality **101**, Upper Cambrian shales, east bank of Barachois River, 6 miles from Little Bras d'Or Lake, Cape Breton, Nova Scotia, varying in outline, owing to compression in the shale. U. S. Nat. Mus. Cat. Nos. 51671b, 51671c, and 51671d, respectively.

1k. Cast of dorsal valve from Locality **3q**, Upper Cambrian shales, Barachois Glen, 4 miles south of Little Bras d'Or Lake, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52441b.

1l. Cast of dorsal valve from Locality **10i**, Upper Cambrian shales, Barachois River, north of Boisdale road, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52442b.

1m. Cast of the interior of a dorsal valve from Locality **323f**, *Ceratopyge* limestone at Vestfossen, 10 miles west-southwest of Christiania, Norway, reproduced from a photograph. The markings of the vascular system are beautifully preserved in the cast. Univ. Min. Inst. Christiania, Norway. Specimen illustrated by Brögger [1882, Pl. X, fig. 10] as *Obolus salteri*.

1n. Interior of a ventral valve from Locality **323w**, Upper Cambrian at Christiania, Norway, flattened in shale. It is one of the largest shells of this species known to the author. Univ. Min. Inst. Christiania, Norway.

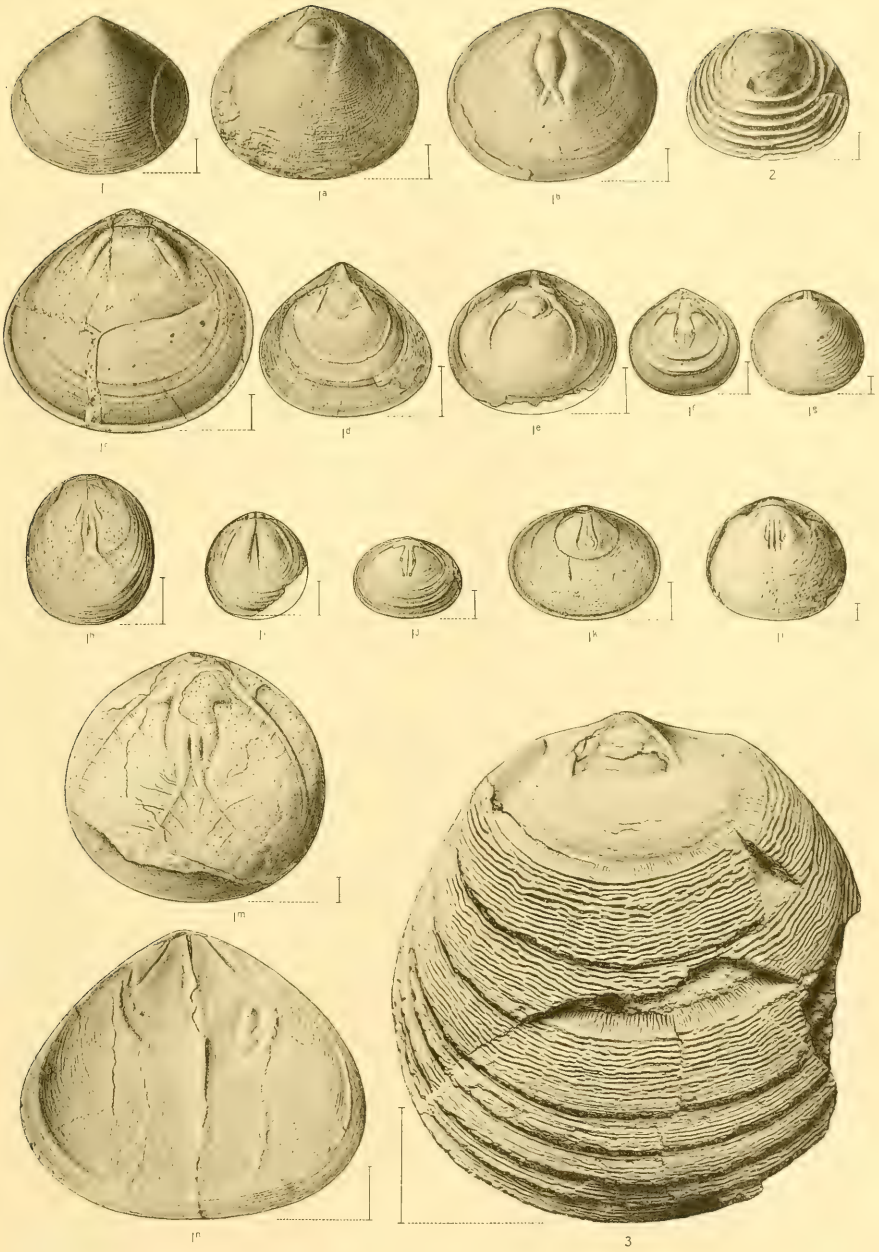
Obolus (Acritis?) rugatus Walcott (p. 441).

Figure 2. Exterior view of the type specimen from Locality **58**, Middle Cambrian Secret Canyon shale, New York and Secret canyons, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 35229a.

Obolus (Acritis) antiquissimus (Eichwald) (p. 437).

[Pl. XV, figs. 2, 2a–d.]

Figure 3. Surface of shell enlarged four and one-half times. Locality **396d**, passage beds between the Upper Cambrian and the Ordovician, "glauconite limestone," at Domglint, in Reval, Esthonia, Russia. U. S. Nat. Mus. Cat. No. 51534a.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE XIV.

PLATE XIV.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral muscle scar.
vs. Main vascular sinus.
s. Median septum.
x. Heart-shaped cavity.

Obolus (Schmidtia) celatus (Volborth) (p. 444).

Figure 1. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 35237a.
1a. Interior of ventral valve. U. S. Nat. Mus. Cat. No. 35237b. Specimen figured by Walcott [1898b, Pl. XXVI, fig. 1] as *Obolus* (*Lingulella*) *celatus*.
1b. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 35237c.
1c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 35237d. Specimen figured by Walcott [1898b, Pl. XXVI, fig. 2] as *Obolus* (*Lingulella*) *celatus*.

The specimens represented are all from Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia.

Obolus (Schmidtia) acuminatus Mickwitz (p. 442).

Figure 2. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 51531a.
2a. Interior of ventral valve. U. S. Nat. Mus. Cat. No. 51531b.
2b. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 51531c.
2c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 51531d.

The specimens represented are all from Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia.

Obolus (Schmidtia) obtusus Mickwitz (p. 448).

Figure 3. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 51532a.
3a. Interior of ventral valve. U. S. Nat. Mus. Cat. No. 51532b.
3b. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 51532c.
3c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 51532d.

The specimens represented are all from Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia.

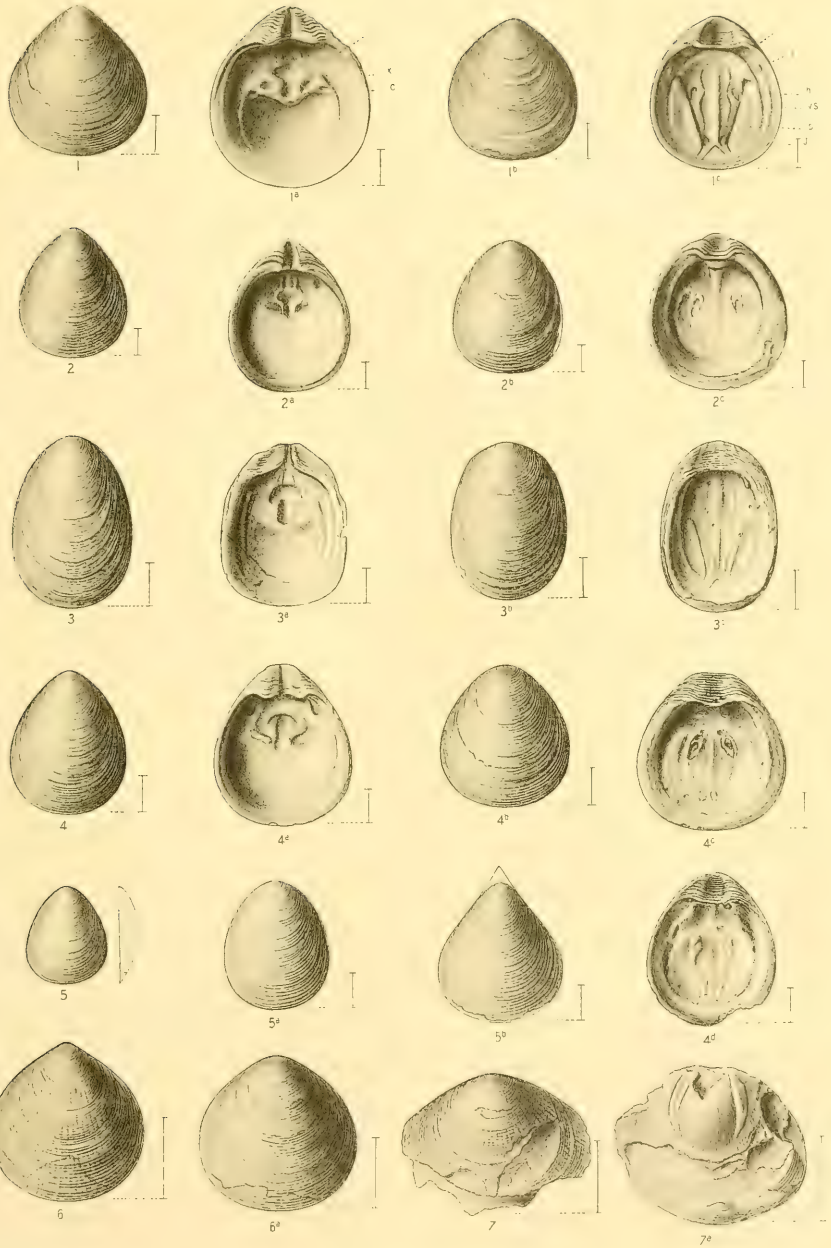
Obolus (Schmidtia) crassus Mickwitz (p. 446).

Figure 4. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 51530a.
4a. Interior of ventral valve. U. S. Nat. Mus. Cat. No. 51530b.
4b. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 51530c.
4c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 51530d.
4d. Interior of an elongate form of a dorsal valve. U. S. Nat. Mus. Cat. No. 51530e.

The specimens represented are all from Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia.

Lingulella (Leptembolon) lingulæformis (Mickwitz) (p. 542).

Figure 5. A large dorsal valve from Locality **396a**, passage beds between the Upper Cambrian and the Ordovician, "glauconite sandstone," at Leppiko, near Leetz, Esthonia, Russia. Copied from Mickwitz [1896, Pl. III, figs. 17a–b].
5a. Small dorsal valve associated with specimen represented by figure 5b. U. S. Nat. Mus. Cat. No. 51537a.
5b. Small ventral valve from Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia. The beak of this specimen was broken away and has been restored in outline on the figure. U. S. Nat. Mus. Cat. No. 51537b.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

OBOLUS APOLLINIS Eichwald (p. 381).

[Text figs. 4, p. 299, and 15, p. 299; and Pl. VII, figs. 1–8, 10–17.]

FIGURE 6. Exterior of a ventral valve. The portion of the frontal margin anterior to the crack running through it has been restored.

6a. Exterior of a dorsal valve. The portion of the frontal margin anterior to the crack running through it has been restored.

The specimens represented in figures 6 and 6a can not now be located. The National Museum records give the locality as **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia, and the catalogue number as 51525. Six other specimens with this catalogue number are figured on Plate VII of this monograph.

OBOLUS APOLLINIS MAXIMUS Mickwitz (p. 384).

[Pl. VII, fig. 9.]

FIGURE 7. Exterior of the central and posterior portions of a dorsal valve that illustrates the character of the outer surface of the numerous layers of the shell. From Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia. U. S. Nat. Mus. Cat. No. 51528b.

7a. Partly exfoliated broken ventral valve, showing the impression of the main vascular sinuses on one of the inner layers of the shell, also the laminated character and interior markings of the shell. From Locality **336j**, Upper Cambrian *Obolus* sandstone at Staroja Ladoga, Government of Novgorod, Russia. U. S. Nat. Mus. Cat. No. 26924a.

PLATE XV.

PLATE XV.

h. Central muscle scar. j. Anterior lateral muscle scar.

Obolus (Mickwitzella) siluricus (Eichwald) (p. 434).

Figure 1. Exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 51538a.
1a. Exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51538b.
1b. Exterior surface of shell. Copied from Mickwitz [1896, Pl. III, fig. 9].
1c. Enlargement of surface of ventral valve. U. S. Nat. Mus. Cat. No. 51538c.

The specimens represented are all from Locality **395a**, passage beds between the Upper Cambrian and the Ordovician, "glauconite sandstone," at Leppiko, near Leetz, Esthonia, Russia.

Obolus (Acritis) antiquissimus (Eichwald) (p. 437).

[Pl. XIII, fig. 3.]

Figures 2, 2a, and 2b. Ventral, side, and dorsal views of specimen preserving the two valves nearly united. The outer surface of the shell is almost entirely exfoliated. U. S. Nat. Mus. Cat. No. 51534b.
2c. Photographic enlargement of the exterior surface of the shell. U. S. Nat. Mus. Cat. No. 51534c.
2d. Exterior of a partly exfoliated dorsal valve, with the side outline of the two valves united. Copied from Mickwitz [1896, Pl. III, figs. 20a–b.]

The specimens represented are all from Locality **396d**, passage beds between the Upper Cambrian and the Ordovician, "glauconite limestone," at Domglint, in Reval, Esthonia, Russia.

Obolus elegans Mickwitz (p. 390).

Figure 3. Exterior of a ventral? valve showing a strongly marked surface. Specimen from Locality **395b**, Upper Cambrian *Obolus* sandstone at Ilgast, Esthonia, Russia. U. S. Nat. Mus. Cat. No. 51535a.

Obolus (Bröggeria) salteri (Holl) (p. 424).

[Pl. XIII, figs. 1, 1a–n.]

Figure 4. Figure of ventral valve, the type specimen, from Locality **304e**, Upper Cambrian "Black shales" at Coal Hill, Malvern Hills, England. Copied from Holl [1865, p. 101, fig. 9]. The figure was also copied by Davidson [1866, Pl. IV, figs. 28a and 28].
4a and 4b. Ventral and dorsal valves occurring in Locality **310h**, Upper Cambrian dark argillaceous shale somewhere in Skåne (Provinces of Malmöhus and Christianstad), Sweden. U. S. Nat. Mus. Cat. Nos. 14931a and 14931b, respectively.
4c. Cast of dorsal valve from Locality **309j**, Upper Cambrian argillaceous shale at Alunbruk, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 51676a.
4d. Partly exfoliated dorsal valve from Locality **309h**, Upper Cambrian very dark siliceous limestone at Fogelsång, Province of Malmöhus, Sweden. U. S. Nat. Mus. Cat. No. 51674a.

Obolus? palliatus Barrande (p. 407).

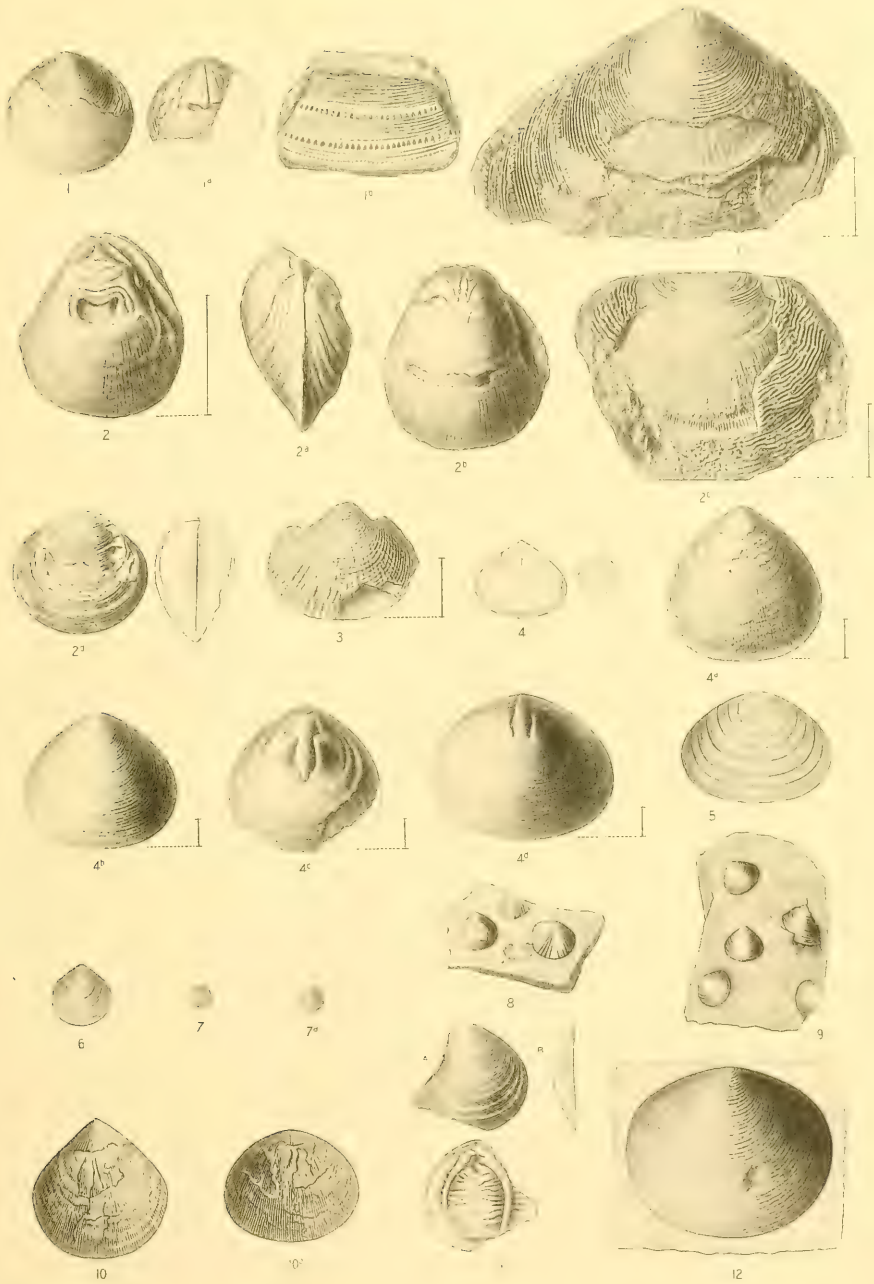
Figure 5. Exterior surface of dorsal valve, the type specimen, from Locality **303c**, passage beds between the Cambrian and Ordovician, in the suburbs of Hof, Bavaria, Germany, one-third natural size. Copied from Barrande [1868a, fig. 65].

Obolus? minor Barrande (p. 405).

Figure 6. Exterior surface of ventral valve, the type specimen, from Locality **303c**, passage beds between the Cambrian and Ordovician, in the suburbs of Hof, Bavaria, Germany, one-third natural size. Copied from Barrande [1868a, fig. 68].

Acrotreta inchoans (Barrande) (p. 690).

Figures 7 and 7a. Two views copied from Barrande [1868a, figs. 74 and 75] of shells from Locality **303c**, passage beds between the Cambrian and the Ordovician, suburbs of Hof, Bavaria, Germany. Figure 7 is the type.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

OBOLUS? sp. undt. e Kayser (p. 423).

FIGURE 8. Ventral valve associated with *Eoorthis saltensis* in Locality **389b**, Upper Cambrian sandstone at Tilcuya, Province of Jujuy, Argentina. Copied from Kayser [1876, Pl. I, fig. 14].

OBOLUS? sp. undt. f Kayser (p. 423).

FIGURE 9. Several valves on small fragment of limestone from Locality **332**, Upper Cambrian at Saimaki, Liaotung, China. Copied from Kayser [1883, Pl. III, fig. 2].

OBOLUS? BAVARICUS (Barrande) (p. 385).

FIGURE 10. Ventral valve, the type specimen, from Locality **303c**, passage beds between the Cambrian and Ordovician, suburbs of Hof, Bavaria, Germany. Copied from Barrande [1868a, fig. 62], who described it as *Lingula bavarica*.

10a. Dorsal valve associated with the shell represented by figure 10 in Locality **303c**. Copied from Barrande [1868a, fig. 64], who described it as *Obolus? palliatus*.

OBOLUS SCHMIDTI Mickwitz (p. 412).

FIGURES 11a–c. Exterior, side, and interior views of a dorsal valve, the type specimen, from Locality **395**, Upper Cambrian *Obolus* sandstone at Joa, near Jegelecht, Esthonia, Russia. Copied from Mickwitz [1896, Pl. II, figs. 14a–c].

OBOLUS? MURRAYI Billings (p. 405).

FIGURE 12. Figure of the original type specimen from Locality **314g**, Lower Ordovician, Maiden Arm, Hare Bay, northern Newfoundland. Geol. Survey Canada. The specimen is the one on which Billings [1865, p. 362] based his species, but he did not figure it.

PLATE XVI.

PLATE XVI.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

OBOLUS (LINGULOBOLUS) AFFINIS (Billings) (p. 431).

FIGURE 1. Cast of the interior of a ventral valve showing the characteristic visceral cavity. U. S. Nat. Mus. Cat. No. 51679a.

1a. Cast of a portion of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51679b.

1b. Cast of the interior of a ventral valve showing the cast of the deep impressions in which the muscle scars are situated. U. S. Nat. Mus. Cat. No. 51679c.

1c. Cast of the interior of a dorsal valve showing the position of the central and anterior lateral muscle scars. U. S. Nat. Mus. Cat. No. 51679d.

1d. Partly exfoliated dorsal valve showing the area and the varied surface of the inner layers of the shell. U. S. Nat. Mus. Cat. No. 51679e.

1e. Outline of the area of a dorsal valve. U. S. Nat. Mus. Cat. No. 51679f.

The specimens represented are all from Locality **114b**, Lower Ordovician sandstone, 1 mile north of Lance Cove, Great Belle Island, Conception Bay, Newfoundland.

OBOLUS (LINGULOBOLUS) SPISSUS (Billings) (p. 432).

[Pl. XLII, figs. 3, 3a.]

FIGURE 2. Dorsal valve from which the outer layers of the shell have been exfoliated so as to show the outline of the visceral cavity and vascular sinuses. U. S. Nat. Mus. Cat. No. 51678 l. Part of the inner surface of this specimen is enlarged on Plate XLII, figure 3a.

2a. Cast of the interior of a dorsal valve, on which portions of the shell remain over the muscle scars. U. S. Nat. Mus. Cat. No. 51678a.

2b. Dorsal valve preserving a portion of the outer surface of the shell, which is enlarged in Plate XLII, figure 3. U. S. Nat. Mus. Cat. No. 51678b.

2c. Partly exfoliated dorsal valve showing something of the character and arrangement of the inner layers of the shell. U. S. Nat. Mus. Cat. No. 51678c.

2d. Partly exfoliated dorsal valve illustrating how the impressions of the vascular sinuses and markings are preserved on the various layers of the shell. U. S. Nat. Mus. Cat. No. 51678d.

2e. Inner layers of the central portion of a ventral valve, showing the characteristic trapezoidal area and vascular sinuses of *Obolus*. U. S. Nat. Mus. Cat. No. 51678e.

2f. Partly exfoliated dorsal valve illustrating peculiarities of the shell not shown by other figures. U. S. Nat. Mus. Cat. No. 51678f.

2g. Cast of the interior of a dorsal valve with vertical and transverse outline of the convexity of the shell. U. S. Nat. Mus. Cat. No. 51678g.

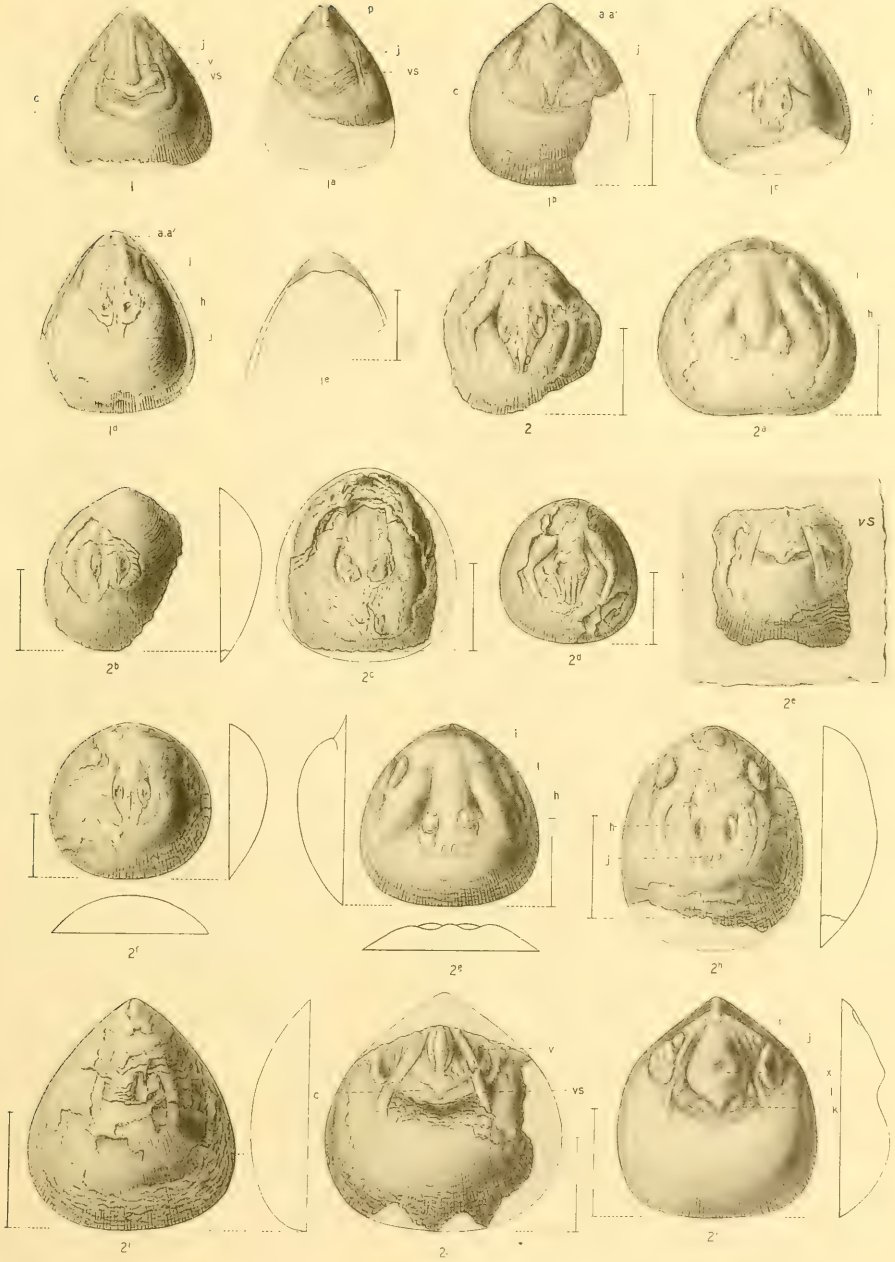
2h. Partly exfoliated dorsal valve that is more elongate than most specimens. U. S. Nat. Mus. Cat. No. 51678h.

2i. An unusually well preserved ventral valve, showing the various layers forming the shell. U. S. Nat. Mus. Cat. No. 51678i.

2j. Interior of a ventral valve as shown by the impression made on the laminated inner layers of the shell, the outer layers being exfoliated. U. S. Nat. Mus. Cat. No. 51678j.

2k. Cast of the interior of a ventral valve, showing muscle scars and vascular markings essentially the same as those of *Obolus*. U. S. Nat. Mus. Cat. No. 51678k.

The specimens represented are all from Locality **114b**, Lower Ordovician sandstone, 1 mile north of Lance Cove, Great Belle Island, Conception Bay, Newfoundland.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLATE XVII.

PLATE XVII.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
g. Umbonal muscle scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral and middle lateral muscle scars.
m. Pedicle muscle scar.
p. Pedicle groove.
ps. Parietal band.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
ivs. Lateral branches of vascular system.
pvs. Peripheral branches of the vascular system.
x. Heart-shaped cavity.
z. Same as ivs of the ventral valve.

Lingulella acutangula (Roemer) (p. 474).

Figure 1. Ventral valve in limestone, from which the shell is partly exfoliated. Locality **69**, Upper Cambrian, Honey Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 27412a. The area of this shell is enlarged in figure 1d.

1a. Cast of the interior of a ventral valve from Locality **353c**, Upper Cambrian sandstone, Llano County, Texas, showing concentric lines of tubercles that fill the punctæ of the interior surface of the shell. U. S. Nat. Mus. Cat. No. 35240a. The area of this shell is enlarged in figure 1b.

1b. Enlargement of cast of area and pedicle groove of figure 1a. U. S. Nat. Mus. Cat. No. 35240a.

1c. Cast of interior of ventral valve, from same locality as the specimen represented in figures 1a and 1b, in which the cast of the visceral cavity and muscle scars is unusually prominent. U. S. Nat. Mus. Cat. No. 35240b. Copied from Walcott [1898b, Pl. XXVII, fig. 6].

1d. Enlargement of the cast of the area of the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 27412a.

1e. Ventral valve in sandstone from Locality **68**, Upper Cambrian, Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. No. 27410a.

1f. Cast of the interior of a ventral valve showing the muscle scars unusually well preserved. Locality **353c**, Upper Cambrian sandstone, Llano County, Texas. U. S. Nat. Mus. Cat. No. 35240c. Copied from Walcott [1898b, Pl. XXVIII, fig. 1].

1g. Cast of the interior of a ventral valve from Locality **69**, Upper Cambrian limestone, Honey Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 27412b.

1h. Cast of the interior of a dorsal valve from Locality **353c**, Upper Cambrian sandstone, Llano County, Texas, in which the interior lateral branches (z) of the vascular system are shown. U. S. Nat. Mus. Cat. No. 35240d. Copied from Walcott [1898b, Pl. XXVIII, fig. 2].

1i. Cast of the interior of a dorsal valve from Locality **69**, Upper Cambrian limestone, Honey Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 27412c.

1j. Cast of the interior of a dorsal valve which shows that the punctate surface of the interior of the shell did not extend to the outer border. From Locality **353c**, Upper Cambrian sandstone, Llano County, Texas. U. S. Nat. Mus. Cat. No. 35240e.

1k. Cast of the interior of a dorsal valve from Locality **68e**, Upper Cambrian sandy limestone, Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. No. 27410b.

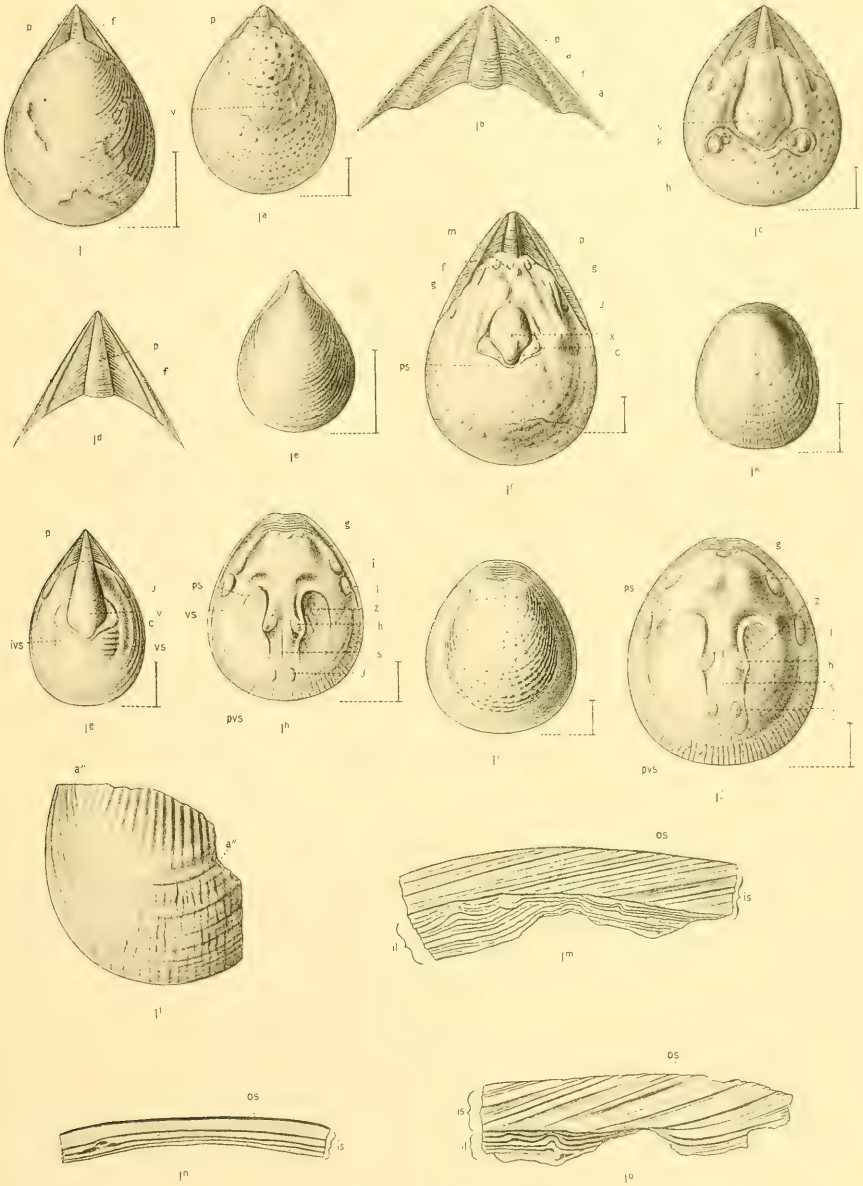
1l. Enlargement of a portion of a ventral valve showing the outer surface in front of the line a″ a″ and the surface of one of the inner layers of the shell back of a″ a″. U. S. Nat. Mus. The specimen from which this figure was drawn can not be located; even the locality is unknown.

1m. Median, longitudinal, thin section through the central portion of a ventral valve; os=thin outer layer without traces of structure; is=obliquely laminated inner layer; il=interior lamellæ produced by the thickening of the shell. U. S. Nat. Mus. Cat. No. 27410c.

1n. Central portion of a transverse median thin section; os=thin outer layer; is=obliquely laminated inner layer. U. S. Nat. Mus. Cat. No. 27410d.

1o. Median longitudinal section through the posterior portion of a ventral valve. Lettering same as for figure 1m. U. S. Nat. Mus. Cat. No. 27410e.

The specimens thin-sectioned for reproduction in figures 1m, 1n, and 1o came from Locality **68e**, Upper Cambrian sandy limestone, Packsaddle Mountain, Llano County, Texas.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE XVIII.

PLATE XVIII.

a. Central lateral space of area.
a'. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella mosia (Hall) (p. 520).

Figure 1. Cast showing part of the interior of a ventral valve from Locality **85s**, Upper Cambrian sandstone at Prairie du Sac, Wisconsin. U. S. Nat. Mus. Cat. No. 27370a.

1a. Cast of a compressed ventral valve from Locality **85x**, Upper Cambrian sandstone near Mazomanie, Wisconsin. U. S. Nat. Mus. Cat. No. 27373a.

1b. Cast of a ventral valve from Locality **78s**, Upper Cambrian sandstone in suburbs of Osceola, Wisconsin. U. S. Nat. Mus. Cat. No. 27371a.

1c. Cast of the interior of a compressed specimen of a ventral valve, showing traces of the interior markings. Locality **S85x**, Upper Cambrian sandstone near Mazomanie, Wisconsin. U. S. Nat. Mus. Cat. No. 27373b.

1d. Cast of the interior of a dorsal valve from Locality **78s**, Upper Cambrian sandstone near Osceola, Wisconsin. U. S. Nat. Mus. Cat. No. 27371b.

1e. Cast of a more elongate dorsal valve from Locality **78**, Upper Cambrian sandstone near Osceola, Wisconsin. U. S. Nat. Mus. Cat. No. 27371c.

1f. Cast of a dorsal valve that is much broader posteriorly than most dorsal valves of the species. Locality **86**, Upper Cambrian sandstone at Gibraltar Bluff, Lodi, Wisconsin. U. S. Nat. Mus. Cat. No. 27372a. A specimen from Locality **S85x** (Cat. No. 27373c) was used to restore portions of this figure.

Lingulella mosia osceola (Walcott) (p. 521).

Figure 2. Cast of a ventral valve, the type specimen, from Locality **78**, Upper Cambrian sandstone near Osceola, Wisconsin. U. S. Nat. Mus. Cat. No. 27327a.

2a. Cast of ventral valve from Locality **78s**, Upper Cambrian sandstone near Osceola, Wisconsin. U. S. Nat. Mus. Cat. No. 27327b.

2b. Enlargement of the area of the cast of a ventral valve, associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 27327c

2c. Cast of a dorsal valve associated with the ventral valve represented by figure 2 U. S. Nat. Mus. Cat. No. 27327d.

Lingulella winona (Hall) (p. 539).

Figure 3. Cast of ventral valve from Locality **78c**, Upper Cambrian sandstone at Osceola, Wisconsin. U. S. Nat. Mus. Cat. No. 27400a.

3a. Partly exfoliated ventral valve from Locality **85s**, Upper Cambrian sandstone at Prairie du Sac, Wisconsin. U. S. Nat. Mus. Cat. No. 33856a.

3b. Partly exfoliated dorsal valve, associated with the specimen represented by figure 3a. U. S. Nat. Mus. Cat. No. 33856b.

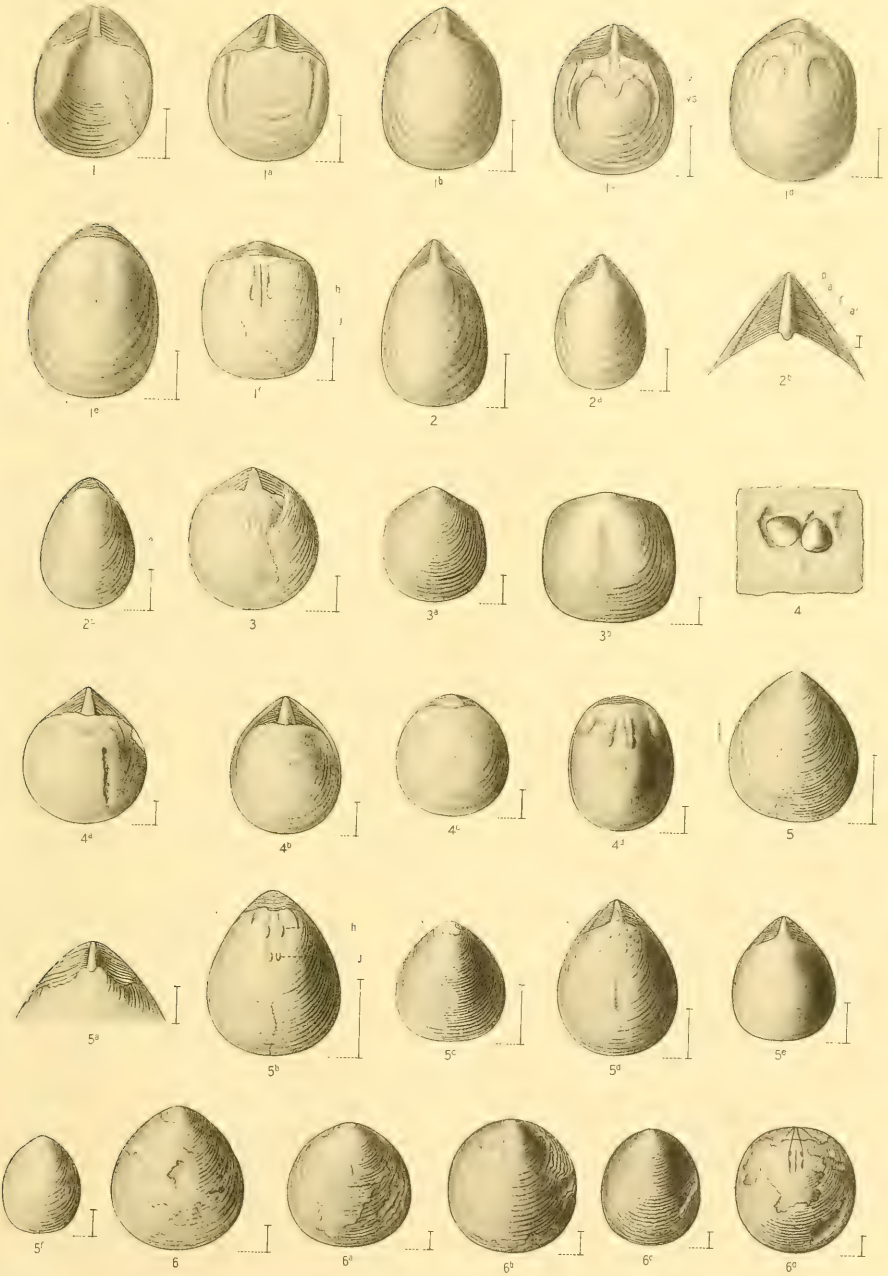
Lingulella winona convexa (Walcott) (p. 540).

Figure 4. Two ventral valves, natural size, from Locality **S85x**, Upper Cambrian sandstone near Mazomanie, Wisconsin. U. S. Nat. Mus. Cat. No. 51854a.

4a and 4b. Casts of ventral valves showing area. Locality **78**, Upper Cambrian sandstone near Osceola, Wisconsin. U. S. Nat. Mus. Cat. Nos. 35235a and 35235b, respectively. Figure 4a represents the type specimen.

4c. Cast of the usual form of dorsal valve. Same locality as specimen represented by figure 4a. U. S. Nat. Mus. Cat. No. 35235c.

4d. Cast of an elongate form of dorsal valve, showing central and anterior lateral scars. Same locality as specimen represented by figure 4a. U. S. Nat. Mus. Cat. No. 35235d.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

LINGULELLA OWENI (Walcott) (p. 523).

FIGURE 5. Ventral valve showing the exterior surface of the shell, from Locality **86**, Upper Cambrian sandstone at Gibraltar Bluff, Lodi, Wisconsin. U. S. Nat. Mus. Cat. No. 25330a.

5a. Enlargement of the area of a cast of a flattened ventral valve in which all traces of a flexure line have been lost. Locality **85s**, Upper Cambrian sandstone at Prairie du Sac, Wisconsin. U. S. Nat. Mus. Cat. No. 27385a.

5b. Cast of the interior of a dorsal valve, the type specimen, associated with the specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 25330b.

5c. A smaller and less elongate dorsal valve than that represented by figure 5b, but from the same locality. U. S. Nat. Mus. Cat. No. 25330c.

5d and 5e. Casts of small ventral valves from Locality **78c**, Upper Cambrian sandstone at Osceola, Wisconsin. U. S. Nat. Mus. Cat. Nos. 27329a and 27329b, respectively.

5f. Cast of a dorsal valve from same locality as specimens represented by figures 5d and 5e. U. S. Nat. Mus. Cat. No. 27329c.

OBOLUS DISCOIDEUS (Hall and Whitfield) (p. 389).

FIGURE 6. Exterior of a partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 24555a.

6a. Dorsal valve, partly exfoliated. U. S. Nat. Mus. Cat. No. 24555b.

6b and 6c. Probably ventral valves, but it is difficult to determine owing to the rounding of the posterior portion of the valve. U. S. Nat. Mus. Cat. Nos. 24555c and 24555d, respectively. Figure 6c is drawn from the type specimen figured by Hall and Whitfield [1877, Pl. I, fig. 2]. The specimen represented by their figure 1 is not redrawn in this monograph.

The specimens represented by figures 6, 6a–c are all from Locality **313j**, Upper Cambrian limestone in the Eureka district, Nevada.

FIGURE 6d. Partly exfoliated dorsal valve, showing outline of visceral area, from Locality **62**, Upper Cambrian Dunderberg shale, north of Adams Hill, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 51547a.

PLATE XIX.

PLATE XIX.

h. Central muscle scar.
j. Anterior lateral muscle scar.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella bellula (Walcott) (p. 482).

Figure 1. Cast of a ventral valve from Locality **114**, Upper Cambrian upper sandstone beds of Little Belle Island, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 27309a.

1a. Cast of the interior of a small ventral valve, the type specimen, from Locality **114a**, Upper Cambrian arenaceous shales about 50 feet below the sandstone of Locality 114, Little Belle Island, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 57082a.

1b. Cast of the interior of a ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 57082b.

1c. Cast of the interior of a dorsal valve, showing the arching of the parietal band outward to the main vascular sinus, associated in the shale with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 57082c.

1d. Cast of the interior of a dorsal valve, showing the median septum and what may be the central muscle scars, associated in the shale with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 57082d.

1e. Interior of a dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 57082e.

Lingulella bella (Walcott) (p. 481).

[Pl. XXXVI, fig. 4.]

Figure 2. Cast of the interior of a ventral valve from Locality **114a**, Upper Cambrian arenaceous shale beneath the upper sandy beds on Little Belle Island, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 27307a.

2a. Cast of the interior of a ventral valve, associated with specimen represented by figure 2, but which is more strongly marked by concentric and radiating striæ. U. S. Nat. Mus. Cat. No. 27307b.

2b. Cast of the interior of a dorsal valve, the area of which, owing to fracture, slightly resembles the area of a ventral valve. From the same bed and locality as specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 27307c.

2c. A somewhat broader dorsal valve than that represented by figure 2b, but associated in the same bed with it. U. S. Nat. Mus. Cat. No. 27307d.

2d. Cast of the interior of a ventral valve from Locality **114b**, Lower Ordovician sandstone 1 mile north of Lance Cove, Great Belle Island, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 27308a.

2e. Finely preserved dorsal valve, associated in the same bed with specimen represented by figure 2d. U. S. Nat. Mus. Cat. No. 27308b.

2f. Cast of the interior of a convex ventral valve from Locality **114**, Upper Cambrian upper sandstone beds of Little Belle Island, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 57081a.

2g. Enlargement of a cast of the area of a dorsal valve, associated in the bed with specimens represented by figures 2d and 2e. U. S. Nat. Mus. Cat. No. 27308c.

2h. Finely preserved ventral and dorsal valves from which the thin outer surface has been exfoliated, the type specimen, associated in the same bed with specimen represented by figure 2d. U. S. Nat. Mus. Cat. No. 27308d.

2i. Dorsal valve from Locality **114b**, see figure 2d. U. S. Nat. Mus. Cat. No. 27308e.

2j. Cast of the interior of a ventral valve, natural size, from Locality **114b**, see figure 2d. U. S. Nat. Mus. Cat. No. 27308f.

2k and 2 l. Exterior of ventral valves from Locality **114b**, see figure 2d. U. S. Nat. Mus. Cat. Nos. 27308g and 27308h, respectively.

2m. Dorsal valve. U. S. Nat. Mus. Cat. No. 27308i.

2n. Dorsal valve. U. S. Nat. Mus. Cat. No. 27308j.

2o. Dorsal valve. U. S. Nat. Mus. Cat. No. 27308k.

2p. Dorsal valve. U. S. Nat. Mus. Cat. No. 27308 l.

2q. Dorsal valve. U. S. Nat. Mus. Cat. No. 27308m.

Figures 2i, 2m–q illustrate variations in the size and outline of dorsal valves from Locality **114b**, Lower Ordovician sandstone, 1 mile north of Lance Cove, Great Belle Island, Conception Bay, Newfoundland.

FRANCES WIESER DEL.

HELIOTYPE CO.

Lingulella ellsi (Walcott) (p. 495).

Figure 3. Ventral valve, the type specimen, slightly distorted by compression, showing the area. U. S. Nat. Mus. Cat. No. 27315a.

3a. Cast of a ventral valve, showing the area and outlines of the visceral cavity. U. S. Nat. Mus. Cat. No. 27315b.

3b. Dorsal valve crushed down into the ventral valve. U. S. Nat. Mus. Cat. No. 27315c.

3c. Dorsal valve slightly distorted by compression. U. S. Nat. Mus. Cat. No. 27315d.

The specimens represented are all from Locality **220a**, Ordovician siliceous shales at the Grand Trunk railroad bridge over Chaudiere River, Quebec, Canada.

Lingulella lævis Matthew (p. 512).

Figure 4. A large dorsal valve, the type specimen. University of Toronto, Canada. Specimen figured by Matthew [1892, Pl. XII, fig. 4b].

4a. Ventral valve flattened in shale. University of Toronto, Canada. Specimen figured by Matthew [1892, Pl. XII, fig. 4a].

4b. Ventral valve flattened in the shale. University of Toronto, Canada.

The specimens represented are all from Locality **301n**, Upper Cambrian shales near the falls at St. John, New Brunswick.

Lingulella lævis grandis Matthew (p. 512).

Figure 4c. Cast of the interior of a dorsal valve from Locality **325b**, Upper Cambrian shale at Escasonie Shore, East Bay, Cape Breton, Nova Scotia. University of Toronto, Canada. Specimen figured by Matthew [1903, Pl. XV, fig. 1d].

Lingulella (Lingulepis) spatula (Walcott) (p. 558).

Figure 5. Nearly perfect ventral valve, the type specimen, from which the outer surface has been exfoliated. U. S. Nat. Mus. Cat. No. 35290a.

5a. Dorsal valve preserving concentric and radiating striæ beneath the outer surface. U. S. Nat. Mus. Cat. No. 35290b.

5b. Cast of the dorsal valve, showing cast of median ridge and pits on the inner surface. U. S. Nat. Mus. Cat. No. 35290c.

The specimens represented are all from Locality **74d**, Middle Cambrian sandstones in Bass Canyon, Grand Canyon of the Colorado, Arizona.

PLATE XX.

PLATE XX.

h. Central muscle scar.
j. Anterior lateral muscle scar.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Lingulella manticula (White) (p. 517).

Figure 1. Cast of the interior of a ventral valve from Locality **313f**, Upper Cambrian limestone at Schellbourne, Schell Creek Range, Nevada. U. S. Nat. Mus. Cat. No. 8569a.

1a. Dorsal valve associated on the same hand specimen with the valve represented by figure 1. U. S. Nat. Mus. Cat. No. 8569b.

1b. Cast showing part of the interior of a more elongate dorsal valve than that represented by figure 1a, but associated on the same hand specimen with it. U. S. Nat. Mus. Cat. No. 8569c.

1c. Type specimen, the ventral valve, from the locality represented by figures 1, 1a–b. U. S. Nat. Mus. Cat. No. 8569d. When the plates were made up this specimen could not be located and the original drawing prepared for White [1877, Pl. III, fig. 2b] was used. The specimen has been found on the same hand specimen with the type of *Acrotreta pyxidicula*.

Obolus rotundatus (Walcott) (p. 411).

Figure 2. A ventral valve, the type specimen, from Locality **313d**, Lower Ordovician limestone near Schellbourne, Schell Creek Range, Nevada. U. S. Nat. Mus. Cat. No. 27337a.

2a. Cast of the interior of a dorsal valve associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. No. 27337b.

2b. Ventral valve from Locality **160a**, Upper Cambrian limestone, west of Bear Creek, south of Gallatin Valley, Montana. U. S. Nat. Mus. Cat. No. 27338a.

2c. A small but very perfect ventral valve associated with the valve represented by figure 2b. U. S. Nat. Mus. Cat. No. 27338b.

2d. A small and characteristic dorsal valve associated with the valves represented by figures 2b and 2c. U. S. Nat. Mus. Cat. No. 27338c.

2e. Dorsal valve from Locality **302b**, Middle Cambrian limestones near Crowfoot Ridge, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 35207a. Specimen figured by Walcott [1899, Pl. LX, fig. 2a] as the dorsal valve of *Obolus* (*Lingulella*) *desideratus*. (See description of fig. 4, below.)

Lingulella pogonipensis (Walcott) (p. 525).

Figure 3. Ventral valve, the type specimen, showing cast of the area and the pedicle furrow. U. S. Nat. Mus. Cat. No. 27332a.

3a. Small, partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 27332b.

3b. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 27332c.

3c. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 27332d.

The specimens represented are all from Locality **201**, passage beds between the Upper Cambrian and the Ordovician, in the ridge east of Hamburg Ridge, Eureka district, Nevada.

Lingulella desiderata (Walcott) (p. 492).

Figure 4. Partly exfoliated ventral valve from Locality **302 l**, Upper Cambrian limestone, Gallatin Range, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 33867a. Type specimen, figured by Walcott [1899, Pl. LX, fig. 2] as *Obolus* (*Lingulella*) *desideratus*. (See description of fig. 2e, above.)

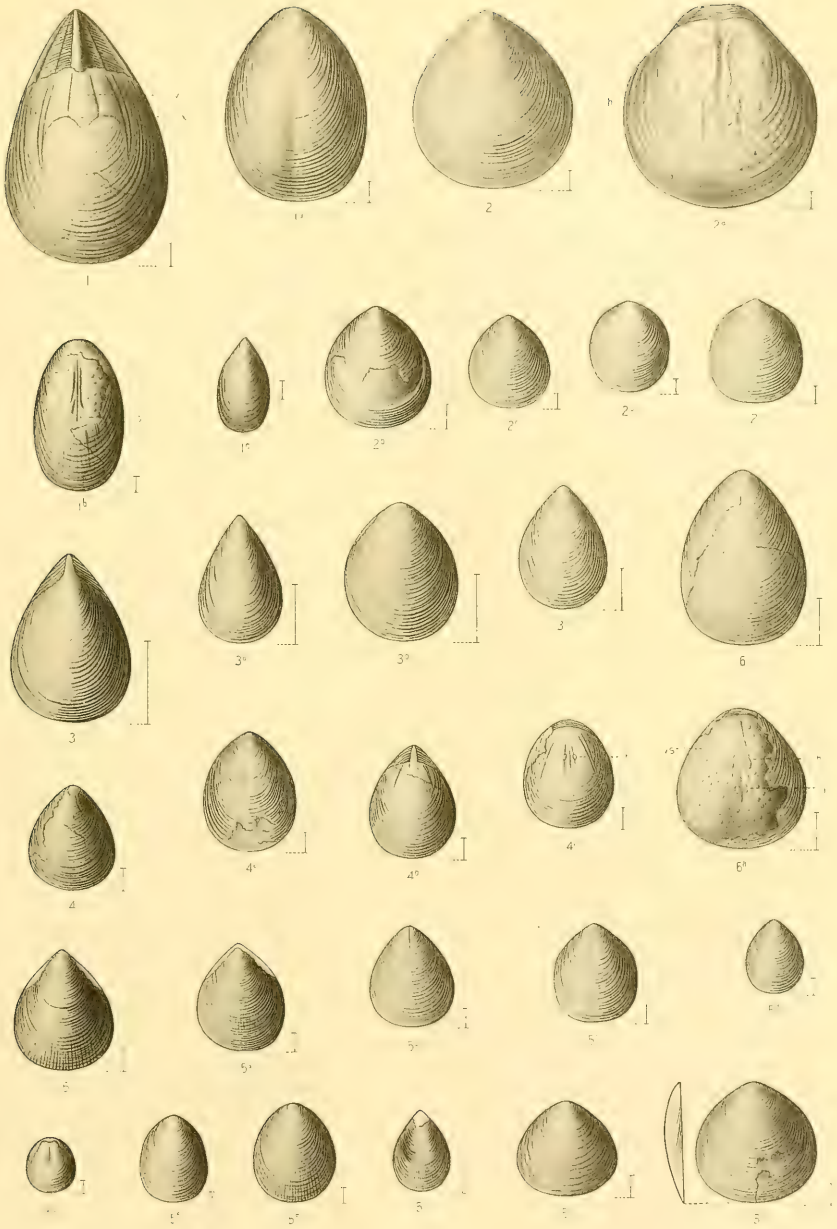
4a. Dorsal valve, associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 33867b.

4b and 4c. Ventral and dorsal valves on the same piece of limestone from Locality **61**, Upper Cambrian, near the Hamburg mine, Eureka district, Nevada. U. S. Nat. Mus. Cat. Nos. 27313a and 27313b, respectively.

5 and 5a. Ventral valves from Locality **94xx**, Middle Cambrian shaly limestones at Givens Mill, on Cowan Creek, Cherokee County, Alabama. U. S. Nat. Mus. Cat. Nos. 27355a and 27355b, respectively.

5b. Ventral valve from Locality **93o**, Upper Cambrian shales near Jordans, on Cowan Creek, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 56990a.

5c. Dorsal valve, slightly distorted in outline, from Locality **94o**, Upper Cambrian shale near Givens Ford, on Cowan Creek, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 56991a.



FRANCES WIESER DEL.

LINGULELLA DESIDERATA (Walcott)—Continued.

FIGURE 5d. Ventral valve from Locality **96**, Upper Cambrian limestone near Rome, Floyd County, Georgia, marked by unusually strong concentric striæ. U. S. Nat. Mus. Cat. No. 51823a.

5e. Dorsal valve associated with the ventral valve illustrated by figure 5d. U. S. Nat. Mus. Cat. No. 51823b.

5f and 5g. Dorsal valves from Locality **107a**, Upper Cambrian shaly limestone near Copper Ridge, 11 miles northwest of Knoxville, Tennessee. U. S. Nat. Mus. Cat. Nos. 27312a and 27312b, respectively.

5h. Large ventral valve from Locality **93**, Upper Cambrian shales near Jordans on Cowan Creek, Cherokee County, Alabama, referred to this species with some doubt. U. S. Nat. Mus. Cat. No. 56990b.

5i. Broad dorsal valve from Locality **93a**, Upper Cambrian shales on the Terrapin Creek road from Center to Amberson, Cherokee County, Alabama, that is doubtfully referred to this species, although there is considerable difference in the form of the shell in most localities at which it occurs. U. S. Nat. Mus. Cat. No. 51841a.

5j. Form similar to that in figure 5i, from Locality **302b**, Upper Cambrian limestone near Crowfoot Ridge, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 27311a. Specimen figured by Walcott [1899, Pl. LX, fig. 3] as *Dicellomus nanus*.

LINGULELLA PUNCTATA (Walcott) (p. 528).

FIGURE 6. Partly exfoliated ventral valve from Locality **58**, Middle Cambrian Secret Canyon shale, Secret and New York canyons, Eureka district, Nevada, showing cast of part of the interior surface of the shell. U. S. Nat. Mus. Cat. No. 27335a. Type specimen, figured by Walcott [1884b, Pl. IX, fig. 3] as *Lingula? manticula*.

6a. Partly exfoliated dorsal valve associated in the same piece of limestone with the specimen represented by figure 6. U. S. Nat. Mus. Cat. No. 27335b. Specimen figured by Walcott [1884b, Pl. XI, fig. 2] as *Lingula? manticula*.

PLATE XXI.

PLATE XXI.

f. Flexure line of area.
g. Umbonal muscle scar.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella perattenuata (Whitfield) (p. 523).

Figure 1. Cast of the interior of a ventral valve from Locality **355**, Middle Cambrian sandstones on Red Canyon Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 27423a.

1a. Cast of the interior of a ventral valve from Locality **74**, Middle Cambrian sandstone, head of Nunkowcap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 51796a.

1b. Narrow, partly exfoliated ventral valve, with the apex rounded, from Locality **355**, Middle Cambrian sandstones on Red Canyon Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 24589a. Type specimen, figured by Whitfield [1880, Pl. II, fig. 9] as *Lingulepis perattenuatus*.

1c. Cast of the interior of a ventral valve associated with the valve represented by figure 1. U. S. Nat. Mus. Cat. No. 27423b. This specimen occurs on the same hand specimen with figured specimens of *Lingulella* (*Lingulepis*) *acuminata*.

1d. Cast of the interior of a dorsal valve associated with the valves represented by figures 1 and 1c. U. S. Nat. Mus. Cat. No. 27423c.

1e. Cast of the interior of a ventral valve from Locality **67c**, Upper Cambrian sandstone, Tatur Hill, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 27424a.

1f. Partly exfoliated dorsal valve from Locality **68y**, Upper Cambrian sandstone, Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. No. 27422a.

1g. Partly exfoliated dorsal valve associated with the valve represented by figure 1f. U. S. Nat. Mus. Cat. No. 27422b.

1h. Cast of the interior of a dorsal valve associated on the same hand specimen with the valve represented by figure 1b. U. S. Nat. Mus. Cat. No. 24589b. Specimen figured by Whitfield [1880, Pl. II, fig. 8] as *Lingulepis perattenuatus*.

1i. Cast of the interior of a dorsal valve associated with the valves represented by figures 1b and 1h. U. S. Nat. Mus. Cat. No. 24589c. Specimen figured by Whitfield [1880, Pl. II, fig. 7] as *Lingulepis perattenuatus*.

Lingulella similis (Walcott) (p. 532).

Figure 2. Cast of the interior of a ventral valve, the type specimen, from Locality **88a**, Middle Cambrian limestone, near Deadwood, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 27339a.

2a. Cast of the interior of a dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 27339b.

2b and 2c. Partly exfoliated ventral and dorsal valves, respectively, associated with the specimens represented by figures 2 and 2a. U. S. Nat. Mus. Cat. Nos. 27339c and 27339d, respectively.

2d. Small, strongly convex dorsal? valve doubtfully referred to this species, from same locality and bed of limestone as the specimens represented by figures 2, 2a–c. U. S. Nat. Mus. Cat. No. 27339e.

2e. Cast of the interior of an unusually convex, elongate ventral valve. U. S. Nat. Mus. Cat. No. 27340a.

2f. Cast of the interior of a ventral valve that narrows toward the frontal margin. U. S. Nat. Mus. Cat. No. 27340b.

2g and 2h. Casts of two dorsal valves that show variation in outline. U. S. Nat. Mus. Cat. Nos. 27340c and 27340d, respectively.

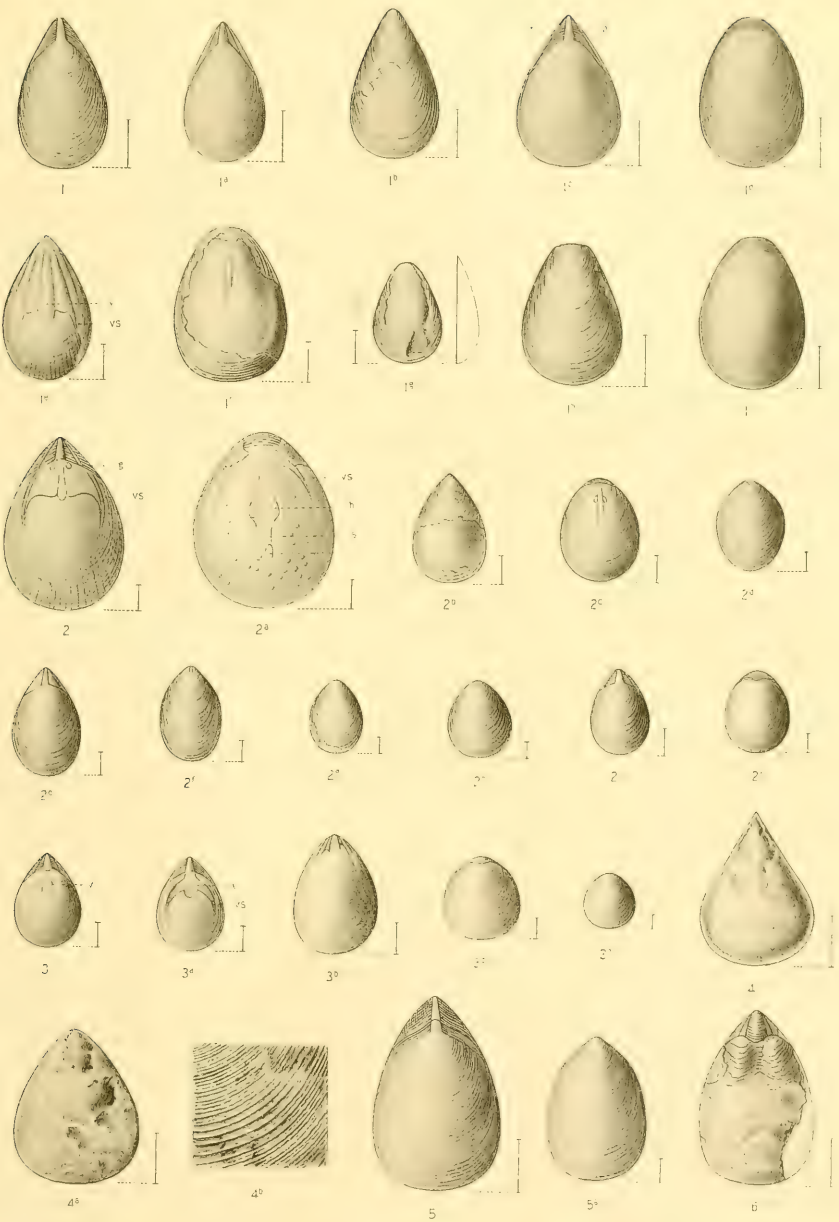
2i and 2j. Casts of associated ventral and dorsal valves that approach most closely the typical forms from the Black Hills. U. S. Nat. Mus. Cat. Nos. 27340e and 27340f, respectively.

The specimens from which figures 2e to 2j are drawn are all from Locality **97a**, Upper Cambrian sandstone, at Winfield, Wisconsin.

Figures 3 and 3a. Casts of the interior of ventral valves from Locality **106**, Middle Cambrian shaly sandstones of the Rome formation, in Bays Mountains, 10 miles (16.1 km.) southeast of Knoxville, Tennessee. U. S. Nat. Mus. Cat. Nos. 27367a and 27367b, respectively.

3b. Cast of the interior of a ventral valve from Locality **10a**, Middle Cambrian, at the same general locality as the specimens represented by figures 3 and 3a. U. S. Nat. Mus. Cat. No. 27326a.

3c and 3d. Casts of the interior of dorsal valves associated with the ventral valves represented by figures 3 and 3a. U. S. Nat. Mus. Cat. Nos. 27367c and 27367d, respectively.


1
1a
1b
1c
1e
1f
1
2
2a
2b
2c
2d
2e
2f
2g
3
3a
3b
4
4a
4b
5
5a
6
vs
FRANCES WIEBER DEL.

LINGULELLA (LINGULEPIS) ROWEI (Walcott) (p. 558).

FIGURE 4. Exfoliated ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51897a.
4a. Exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 51897b.
4b. Enlargement of the outer surface of another specimen. U. S. Nat. Mus. Cat. No. 51897c.

The three specimens from which figures 4, 4a–b are drawn are from Locality **14p**, Lower Cambrian limestone near Resting Springs, Inyo County, California.

LINGULELLA RANDOMENSIS (Walcott) (p. 530).

FIGURE 5. Ventral valve, the type specimen, showing the cast of the area and pedicle groove. U. S. Nat. Mus. Cat. No. 35208a.
5a. Dorsal valve associated with specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 35208b.

The specimens represented are both from Locality **6y**, Upper Cambrian, on the north side of Random Island, between Birch and Sandy points, Smith Sound, Trinity Bay, Newfoundland.

LINGULELLA SCHUCHERTI (Walcott) (p. 530).

FIGURE 6. Cast of a ventral valve, the type specimen, showing the area and pedicle furrow, from Locality **367**, Lower Cambrian limestone, Troy, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 51775a.

PLATE XXII.

PLATE XXII.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
ps. Parietal band.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Lingulella granvillensis Walcott (p. 504).

Figure 1. Exterior of partly exfoliated ventral valve from Locality **38a**, Lower Cambrian limestone, 2 miles south of North Granville, Washington County, New York. U. S. Nat. Mus. Cat. No. 17440a. Type specimen, figured by Walcott [1887, Pl. I, fig. 15b; and 1891a, Pl. LXVII, fig. 4b]. The specimen figured by Walcott [1887, Pl. I, fig. 15c; and 1891a, Pl. LXVII, fig. 4c] is not refigured in this monograph. It is in the collections of the United States National Museum, Catalogue No. 17440e.

1a. Exterior of partly exfoliated ventral valve associated with the valve represented by figure 1. U. S. Nat. Mus. Cat. No. 17440b.

1b. Interior of a small ventral valve from Locality **37b**, Lower Cambrian, one-fourth mile east of Salem, Washington County, New York, showing the visceral cavity and main vascular sinuses. U. S. Nat. Mus. Cat. No. 52036a.

1c. Exterior of a partly exfoliated dorsal valve associated with the valve represented by figures 1 and 1a. U. S. Nat. Mus. Cat. No. 17440c. Specimen figured by Walcott [1887, Pl. I, fig. 15; and 1891a, Pl. LXVII, fig. 4].

1d. Cast of the interior of a dorsal valve associated with the valves represented by figures 1, 1a, and 1c, showing the visceral area with its muscle scars, and an unusually complex system of vascular canals. U. S. Nat. Mus. Cat. No. 17440d. Specimen figured by Walcott [1887, Pl. I, fig. 15a: and 1891a, Pl. LXVII, fig. 4a].

Obolus lamborni (Meek) (p. 393).

Figure 2. Interior of a flattened ventral valve from Locality **11j**, Middle Cambrian shale at Mine Lamotte, Madison County, Missouri. U. S. Nat. Mus. Cat. No. 51553a.

2a. Cast of the interior of a ventral valve associated with the valve represented by figure 2. U. S. Nat. Mus. Cat. No. 51553b.

2b. Very fine cast of the interior of a ventral valve from Locality **121**, Middle Cambrian Rogersville shale, road just east of Harlan Knob, 4 miles northeast of Rogersville, Hawkins County, Tennessee. U. S. Nat. Mus. Cat. No. 51558a.

2c. Cast of the interior of a ventral valve associated with the specimen represented by figure 2b, which has very much the same appearance as the specimen represented by figure 2a from the shale in Missouri. U. S. Nat. Mus. Cat. No. 51558b.

2d. Cast of the outer surface of a ventral valve associated with the valves represented by figures 2b and 2c, showing the strong concentric striæ and fine radiating striæ. U. S. Nat. Mus. Cat. No. 51558c.

2e and 2f. Casts of the interior of compressed ventral valves associated with those represented by figures 2b–d, illustrating variation in form, figure 2f being the result of distortion. U. S. Nat. Mus. Cat. Nos. 51558d and 51558e, respectively.

2g and 2h. Very fine interior casts of dorsal valves associated with the ventral valves illustrated by figures 2b–f. The variation in the character of the inner surface is well illustrated by these two figures; in figure 2h there are only faint indications of papillæ, while in figure 2g they are abundant. U. S. Nat. Mus. Cat. Nos. 51558f and 51558g, respectively. The area of figure 2h is represented in figure 2m.

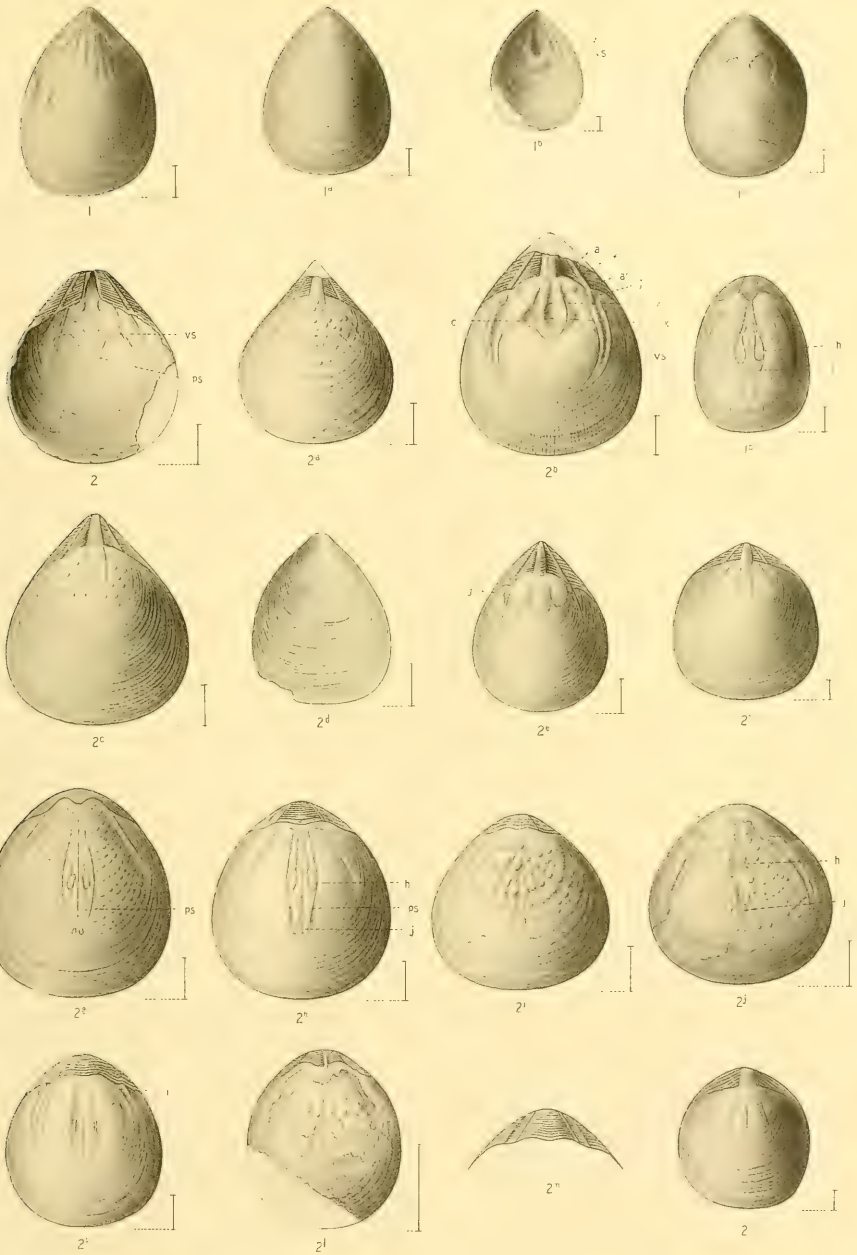
2i and 2j. Casts of the interior of two dorsal valves associated with the two ventral valves represented by figures 2 and 2a, at Locality **11j**, near Mine Lamotte, Missouri. U. S. Nat. Mus. Cat. Nos. 51553c and 51553d, respectively. Figure 2j represents the type specimen.

2k. Cast of a dorsal valve associated with the valves represented by figures 2b–h (Locality **121**), that illustrates variation in form. U. S. Nat. Mus. Cat. No. 51558h.

2l. Cast of large dorsal valve from Locality **124a**, Middle Cambrian shales on Big Creek, southeast of Harlan Knob, 4 miles northeast of Rogersville, Hawkins County, Tennessee. U. S. Nat. Mus. Cat. No. 51557a.

2m. Enlargement and partial restoration of the area of the dorsal valve represented by figure 2h. U. S. Nat. Mus. Cat. No. 51558g.

2n. Cast of a dorsal valve associated with the valves represented by figures 2b–h. U. S. Nat. Mus. Cat. No. 51558i.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLATE XXIII.

PLATE XXIII.

a. Central lateral space of area.
a'. Outer lateral space of area.
f. Flexure lines of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Obolus willisi (Walcott) (p. 420).

Figure 1. Cast of a ventral valve, the type specimen, compressed in shale, Locality **140a**, Middle Cambrian, near Cave Spring, Floyd County, Georgia. U. S. Nat. Mus. Cat. No. 27345a.

1a. Cast of a ventral valve compressed in shale, Locality **107b**, Middle Cambrian, near Copper Ridge, 11 miles northwest of Knoxville, Tennessee. U. S. Nat. Mus. Cat. No. 27343a.

1b. Cast of a ventral valve compressed in shale, that shows the pitted or punctate character of the interior of the shell. Same locality as specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 27343b.

1c. Cast of the outer surface of a ventral valve, from same band of shale as specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 27343c.

1d. Cast of the outer surface of a dorsal valve associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 27343d.

1e. Cast of a ventral valve distorted by compression in the same band of shale as the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 27343e.

1f. Cast showing part of a ventral valve, the outline of which is restored from associated specimens. It occurs in the calcareous sandstone embedded in the shales of Locality **107b**, Middle Cambrian, near Copper Ridge, 11 miles northwest of Knoxville, Tennessee. U. S. Nat. Mus. Cat. No. 27343f.

1g. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 27343g.

1h. Cast of the interior of a dorsal valve associated with specimen represented by figure 1f but which is more transverse. U. S. Nat. Mus. Cat. No. 27343h.

1i. Distorted cast of a ventral valve from Locality **101b**, Middle Cambrian shale 3.5 miles southwest of Rogersville, Tennessee. U. S. Nat. Mus. Cat. No. 27344a.

1j. Flattened ventral valve, showing the strong interrupted radiating lines and the strong concentric rugose lines of growth. Locality **93**, Upper Cambrian shale, near Jordans on Cowan Creek, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 27346a.

Lingulella tarpa (Walcott) (p. 534).

Figure 2. Exfoliated ventral valve from sandy shales, which shows general outline and some of the markings of the interior of the shell. U. S. Nat. Mus. Cat. No. 27342a.

2a. Compressed, slightly distorted ventral valve, the type specimen, from argillaceous shales interbedded with the sandy shales in which the specimen represented by figure 2 occurs. U. S. Nat. Mus. Cat. No. 27342b.

2b. Cast of a dorsal valve, from calcareous layers in the sandy shale in which specimen represented by figure 2 occurs. U. S. Nat. Mus. Cat. No. 27342c.

2c. Somewhat more elongate shell than that represented by figure 2b, with which it is associated, and which is somewhat doubtfully identified as a dorsal valve. U. S. Nat. Mus. Cat. No. 27342d.

The specimens represented are all from Locality **11**, Middle Cambrian, 1 mile east of Post Oak Springs, Roane County, Tennessee.

Obolus mcconnelli (Walcott) (p. 396).

Figure 3. Interior of a crushed and broken ventral valve, the type specimen, from Locality **14s**, Middle Cambrian *Oygopsis* zone on Mount Stephen, British Columbia. U. S. Nat. Mus. Cat. No. 51572a.

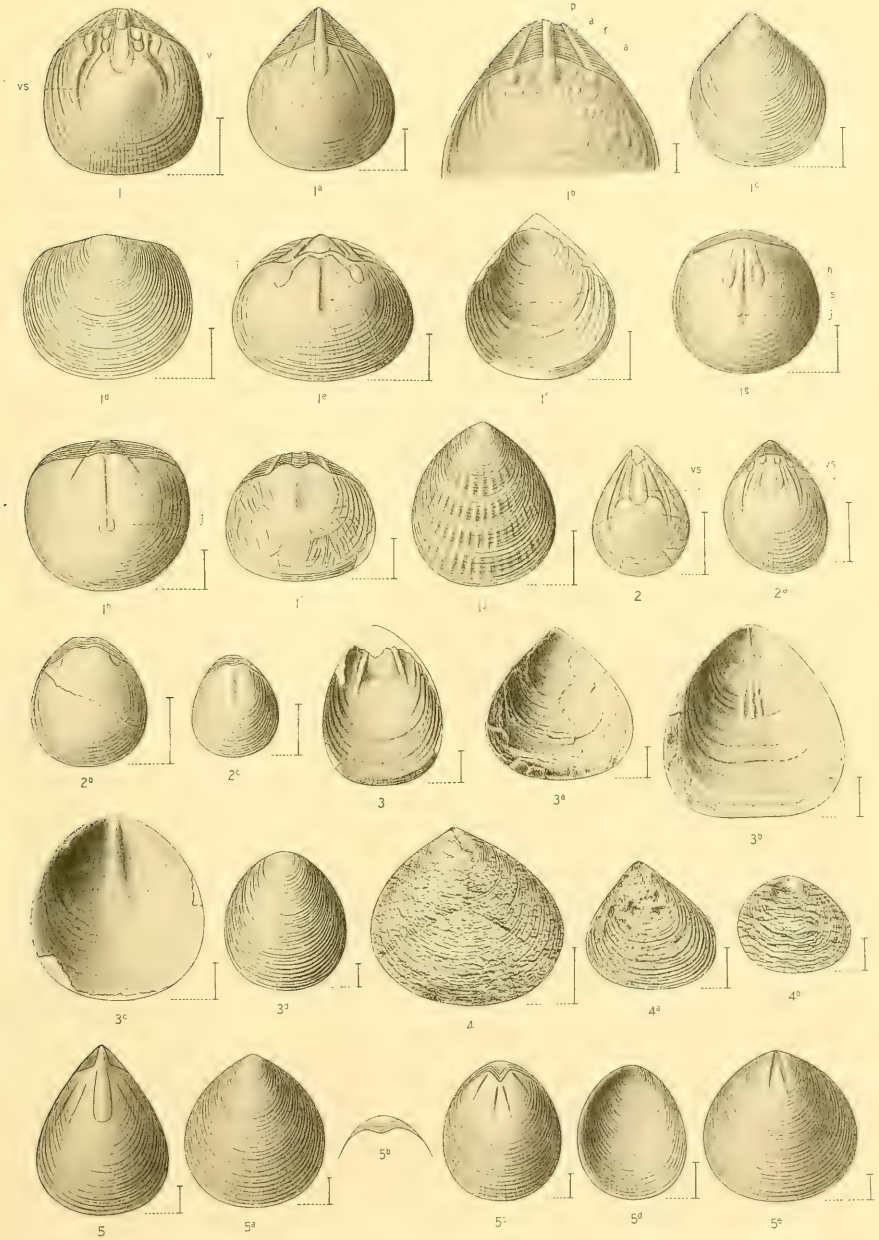
3a. Interior of an associated fragmentary ventral valve of the broad form. U. S. Nat. Mus. Cat. No. 51572b. Copied from Walcott [1908c, Pl. I, fig. 2]. (See note under fig. 3d, below.)

Obolus mcconnelli pelias (Walcott) (p. 398).

[Pl. XXXIX, figs. 5, 5a–c.]

Figure 3b. Interior of a broad form of dorsal valve, the type specimen, from Locality **11q**, Middle Cambrian Marjum limestone, ridge east of Wheeler Amphitheater, House Range, Utah. U. S. Nat. Mus. Cat. No. 51592a.

3c. Interior of an associated dorsal valve. U. S. Nat. Mus. Cat. No. 51592b.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Obolus septalis (Walcott) (p. 414).

[Pl. XXXIV, figs. 2, 2a.]

Figure 3d. Dorsal valve from Locality **14s**, Middle Cambrian *Ogygopsis* zone on Mount Stephen, British Columbia. U. S. Nat. Mus. Cat. No. 24069a. Copied from Walcott [1908c, Pl. I, fig. 2a], where it was figured as *Obolus mcconnelli*.

Obolus mcconnelli decipiens Walcott (p. 398).

Figure 4. Compressed ventral valve, the type specimen, from Locality **7v**, Upper Cambrian shales 4.25 miles south-southeast of Emigrant Peak, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 51586a.

4a. Compressed ventral valve from Locality **8m**, Middle Cambrian limestone 4 miles northeast of Osceola, White Pine County, Nevada. U. S. Nat. Mus. Cat. No. 51585a.

4b. Ventral valve associated with specimen represented by figure 4a. U. S. Nat. Mus. Cat. No. 51585b.

Obolus fragilis (Walcott) (p. 392).

Figure 5. Cast of the interior of a ventral valve, the type specimen, from Locality **1**, Middle Cambrian shales on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 27317a.

5a. Dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 27317b.

5b. Outline of the dorsal valve, showing area, from Locality **2**, Middle Cambrian shale from a higher horizon than that represented by figure 5, on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 56911a.

5c. Cast of the interior of a dorsal valve associated with the specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 27317c.

5d. Cast of the interior of a dorsal valve, showing concentric and radiating striæ, associated with specimen represented by figure 5b. U. S. Nat. Mus. Cat. No. 56911b.

5e. Broad dorsal valve associated with specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 27317d.

PLATE XXIV.

PLATE XXIV.

a. Central lateral space of area.
a'. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella nanno (Walcott) (p. 521).

Figures 1 and 1a. Ventral valves, preserving natural form and convexity, from Locality **16**, Middle Cambrian limestones in Blountsville Valley, Blount County, Alabama. U. S. Nat. Mus. Cat. Nos. 27328a and 27328b, respectively. Figure 1a represents the type specimen.

1b and 1c. Dorsal valves associated with the specimens represented by figures 1 and 1a. U. S. Nat. Mus. Cat. Nos. 27328c and 27328d, respectively.

1d. Unusually large and convex dorsal valve from Locality **91**, Middle Cambrian limestone at Cedar Bluff, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 57005a.

Lingulella leos (Walcott) (p. 513).

Figure 2. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 27323a.

2a. Cast of the interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 27323b.

2b and 2c. Casts of interior of two dorsal valves. 2c is strongly convex and unusually narrow and elongate. U. S. Nat. Mus. Cat. Nos. 27323c and 27323d, respectively.

The specimens represented are all from Locality **96**, Upper Cambrian limestone, 1.5 miles south of Rome, Floyd County, Georgia.

Lingulella helena (Walcott) (p. 506).

Figure 3. Exterior of a slightly distorted ventral valve from Locality **302s**, Middle Cambrian siliceous shale 1.5 miles south of Helena, Lewis and Clark County, Montana. U. S. Nat. Mus. Cat. No. 27320a.

3a and 3b. Casts in siliceous shale of the interior of two ventral valves that differ in outline, from the locality represented by figure 3. U. S. Nat. Mus. Cat. Nos. 27320b and 27320c, respectively. Figure 3a represents the type specimen.

3c. Cast of the interior of a dorsal valve showing area, from the locality represented by figure 3. U. S. Nat. Mus. Cat. No. 27320d.

3d. Small ventral valve doubtfully referred to the species, from Locality **30a**, Middle Cambrian shale in Big Cottonwood Canyon, near Salt Lake City, Utah. U. S. Nat. Mus. Cat. No. 51819a.

Lingulella dubia (Walcott) (p. 494).

Figure 4. Cast of interior of ventral valve, the type specimen, associated with *Obolus (Westonia) ella* at Locality **31**, Middle Cambrian shales at Pioche, Nevada. U. S. Nat. Mus. Cat. No. 27314a.

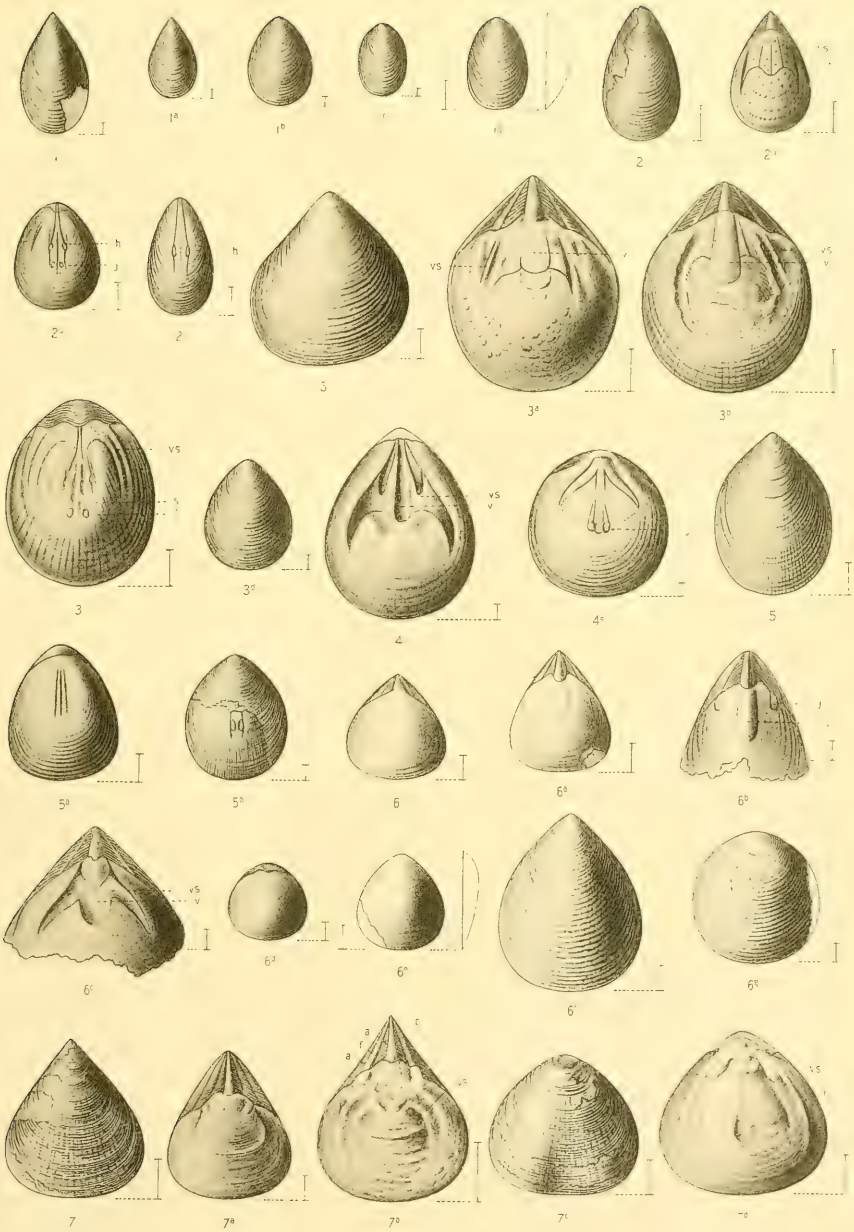
4a. Cast of interior of dorsal valve on same piece of shale with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 27314b.

Lingulella arguta (Walcott) (p. 478).

Figure 5. Perfect ventral valve, the type, from Locality **313f**, Upper Cambrian limestone at Schellbourne, Schell Creek Range, Nevada. U. S. Nat. Mus. Cat. No. 27305a. Drawn from specimen represented by White [1877, Pl. III, fig. 2a] as *Lingula? manticula*.

5a. Dorsal valve that is doubtfully referred to this species from Locality **313a**, Middle Cambrian limestone at Schellbourne, Nevada. U. S. Nat. Mus. Cat. No. 51845a.

5b. Partly exfoliated dorsal valve from Locality **10y**, Middle Cambrian Marjum limestone, near Marjum Pass, House Range, Utah. U. S. Nat. Mus. Cat. No. 58303.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

LINGULELLA AUGA (Walcott) (p. 480).

FIGURES 6 and 6a. Casts in shaly limestone of interior of two ventral valves. U. S. Nat. Mus. Cat. Nos. 27306a and 27306b, respectively.

6b. Cast of the posterior portion of the interior of a distorted ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 27306c.

6c. Cast of the posterior portion of the interior of a ventral valve, showing a trace of the visceral area. U. S. Nat. Mus. Cat. No. 27306d.

6d and 6e. Casts of the interior of two dorsal valves. U. S. Nat. Mus. Cat. Nos. 27306e and 27306f respectively.

The specimens illustrated by figures 6, 6a–e are from Locality **10a**, Middle Cambrian shaly sandstones at Shooks Gap, 10 miles southeast of Knoxville, Tennessee.

FIGURES 6f and 6g. Ventral and dorsal valves from Locality **10b**, a siliceous limestone interbedded in the Middle Cambrian shaly sandstones at Shooks Gap, 10 miles southeast of Knoxville, Tennessee. The outer surface with strong concentric striæ is finely preserved. U. S. Nat. Mus. Cat. Nos. 27306g and 27306h, respectively.

LINGULELLA TUMIDA Matthew (p. 537).

FIGURE 7. Exterior of ventral valve from Locality **13i**, Middle Cambrian sandy shales on Gillis Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51769a.

7a. Cast of the interior of a ventral valve associated with the shell represented by figure 7, showing the high area and strong vascular sinuses. U. S. Nat. Mus. Cat. No. 51769b.

7b. Cast of the interior of a ventral valve from Locality **13r**, a little different horizon from that represented by Locality 13i, Middle Cambrian sandy shales on Gillis Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 57011a.

7c. Exterior of ventral valve associated with the shell represented by figure 7. U. S. Nat. Mus. Cat. No. 51769c.

7d. Cast of the interior of a ventral valve associated with the shell represented by figure 7b, retaining a portion of the shell on the umbo. U. S. Nat. Mus. Cat. No. 57011b.

PLATE XXV.

PLATE XXV.

a. Central lateral space of area.
a′. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
ps. Parietal band.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella hayesi (Walcott) (p. 505).

Figure 1. Cast of the interior of a ventral valve, showing the area and portions of the visceral cavity. U. S. Nat. Mus. Cat. No. 27319j.

1a. Interior of a partly weathered ventral valve. U. S. Nat. Mus. Cat. No. 27319a.

1b and 1c. Casts of the interior of the ventral valve, showing the position of the main vascular sinuses, the visceral cavity, and the area. U. S. Nat. Mus. Cat. Nos. 27319b and 27319c, respectively. Figure 1b represents the type specimen.

1d. Enlargement of the cast of the area of the ventral valve, showing the pedicle groove, the flexure line, and the central and outer lateral spaces of the area. U. S. Nat. Mus. Cat. No. 27319d.

1e. Cast of the interior of a dorsal valve showing the position of the central (h) and anterior lateral (j) muscle scars, the scar of the parietal band (ps), also the arching forward of the center of the area. U. S. Nat. Mus. Cat. No. 27319e.

1f, 1g, 1h, and 1i. Casts of the interior of dorsal valves, showing variation in form of the valve and in the position of the parietal band and main vascular sinus. The latter is especially well shown by figure 1g. U. S. Nat. Mus. Cat. Nos. 27319f, 27319g, 27319h, and 27319i, respectively.

1j. Enlargement of the area of the dorsal valve represented by figure 1f. U. S. Nat. Mus. Cat. No. 27319f.

All of the specimens represented occur on the exterior of siliceous nodules, or on breaks across them, from Locality **90x**, Middle Cambrian Conasauga shale, Coosa Valley, Cherokee County, Alabama.

Obolus (Westonia) chuarensis (Walcott) (p. 454).

Figures 2 and 2a. Partly exfoliated ventral valves from Locality **73a**, Middle Cambrian sandstone, Chuar Valley, Grand Canyon of the Colorado, Arizona, showing some variation in form. U. S. Nat. Mus. Cat. Nos. 57020a and 57020b, respectively. Figure 2 represents the type specimen.

2b. Crushed ventral valve from Locality **74b**, Middle Cambrian sandstone in Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 57021a.

2c. Exterior of a rather large dorsal valve from Locality **74**, Middle Cambrian sandstone at the head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 27310a.

2d. Cast of part of the interior of a dorsal valve associated with the shells represented by figures 2 and 2a, showing a median depression and the area. U. S. Nat. Mus. Cat. No. 57020c.

2e. Strongly marked cast of the interior of a dorsal valve associated with the shell represented by figure 2c, showing the depression filled by the ridges adjacent to the main vascular sinuses, a strong central groove corresponding to the median septum, and the central muscle scars (h). U. S. Nat. Mus. Cat. No. 27310b.

Obolus zetus (Walcott) (p. 421).

Figures 3, 3a, and 3b. Partly exfoliated ventral valves, showing the external form and something of the character of the different layers forming the shell. U. S. Nat. Mus. Cat. Nos. 27347a, 27347b, and 27347c, respectively. Figure 3a represents the type specimen.

3c. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 27347d.

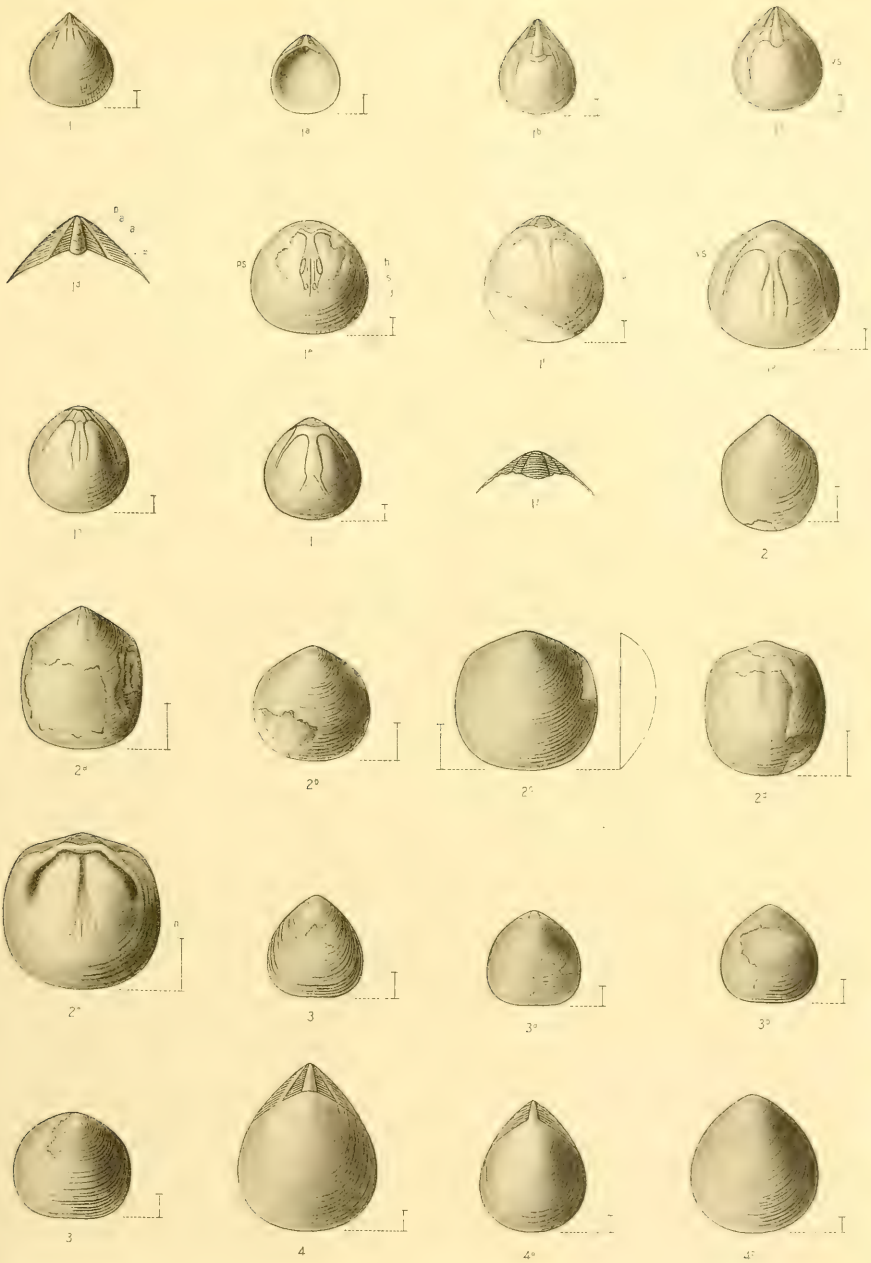
The specimens represented are all from Locality **74**, Middle Cambrian sandstone, near the head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona.

Obolus lamborni minimus (Walcott) (p. 395).

Figures 4 and 4a. Casts of ventral valves that were compressed in the shale. U. S. Nat. Mus. Cat. Nos. 27322a and 27322b, respectively. Figure 4 represents the type specimen.

4b. Dorsal valve associated with the ventral valves represented by figures 4 and 4a. U. S. Nat. Mus. Cat. No. 27322c.

The specimens illustrated are all from Locality **101a**, Middle Cambrian Rogersville shale, 3.5 miles southwest of Rogersville, Hawkins County, Tennessee.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE XXVI.

PLATE XXVI.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
g. Umbonal muscle scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
m. Pedicle muscle.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella phaon (Walcott) (p. 525).

Figure 1. Ventral valve from Locality **84a**, Upper Cambrian sandstone at River Junction, Houston County, Minnesota, the exterior of which has been slightly injured by abrasion. U. S. Nat. Mus. Cat. No. 27406a.

1a. Dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 27406b.

1b. Strongly marked cast of the interior of a ventral valve from Locality **98x**, Upper Cambrian sandstone near Eau Claire, Wisconsin. This specimen shows the broken edge of the undercut that extended back under the area and the deeply impressed character of the channels of the main vascular sinuses; also the large size of the pits or punctæ on the interior of the shell. U. S. Nat. Mus. Cat. No. 27331a.

1c. Cast of the interior of a ventral valve, the type specimen, associated with the specimen represented by figure 1b, showing more definitely the interior features of the shell. The divided umbonal muscle scars and the pedicle muscle scar are drawn from an associated ventral valve. The central, middle lateral, and outside lateral muscle scars are not differentiated in the deeply impressed trapezoidal area (c); the anterior lateral muscle scars (j) are well shown. U. S. Nat. Mus. Cat. No. 27331b.

1d. Interior cast of a dorsal valve associated with the specimen represented by figure 1b, having the same strongly marked characteristics as the casts of the ventral valve. The cast of the central ridge is very pronounced, and it is difficult to say just where the central muscle scars (h) were located. They appear to be, however, as indicated on the drawing, which brings them very close to the small anterior lateral scars. U. S. Nat. Mus. Cat. No. 27331c.

1e. Interior cast of a very strongly marked dorsal valve associated with the specimen represented by figure 1b, in which the detailed characters are lost. The general effect of this cast is much like that of the interior cast of the dorsal valve of *Lingulella grandis* (Pl. XXXVIII, fig. 2d). U. S. Nat. Mus. Cat. No. 27331d.

Obolus sinoe (Walcott) (p. 415).

Figure 2. Interior cast of a ventral valve. U. S. Nat. Mus. Cat. No. 27341a.

2a. Interior of a ventral valve preserving the area and showing the undercut beneath the area. The impressions of the visceral cavity are indistinct. U. S. Nat. Mus. Cat. No. 27341b. Another specimen (Cat. No. 27341c) was used to restore parts of the drawing.

2b. Cast of the interior of a ventral valve, showing a portion of the shell and the posterior portion of the main vascular sinuses. U. S. Nat. Mus. Cat. No. 27341d.

2c. Dorsal valve from which the exterior layer has been removed so as to show the edges of the oblique interior lamellæ. U. S. Nat. Mus. Cat. No. 27341e.

2d. Cast showing part of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 27341f.

The specimens represented by figures 2, 2a–d are from Locality **68y**, Upper Cambrian reddish brown sandstone on Packsaddle Mountain, Llano County, Texas.

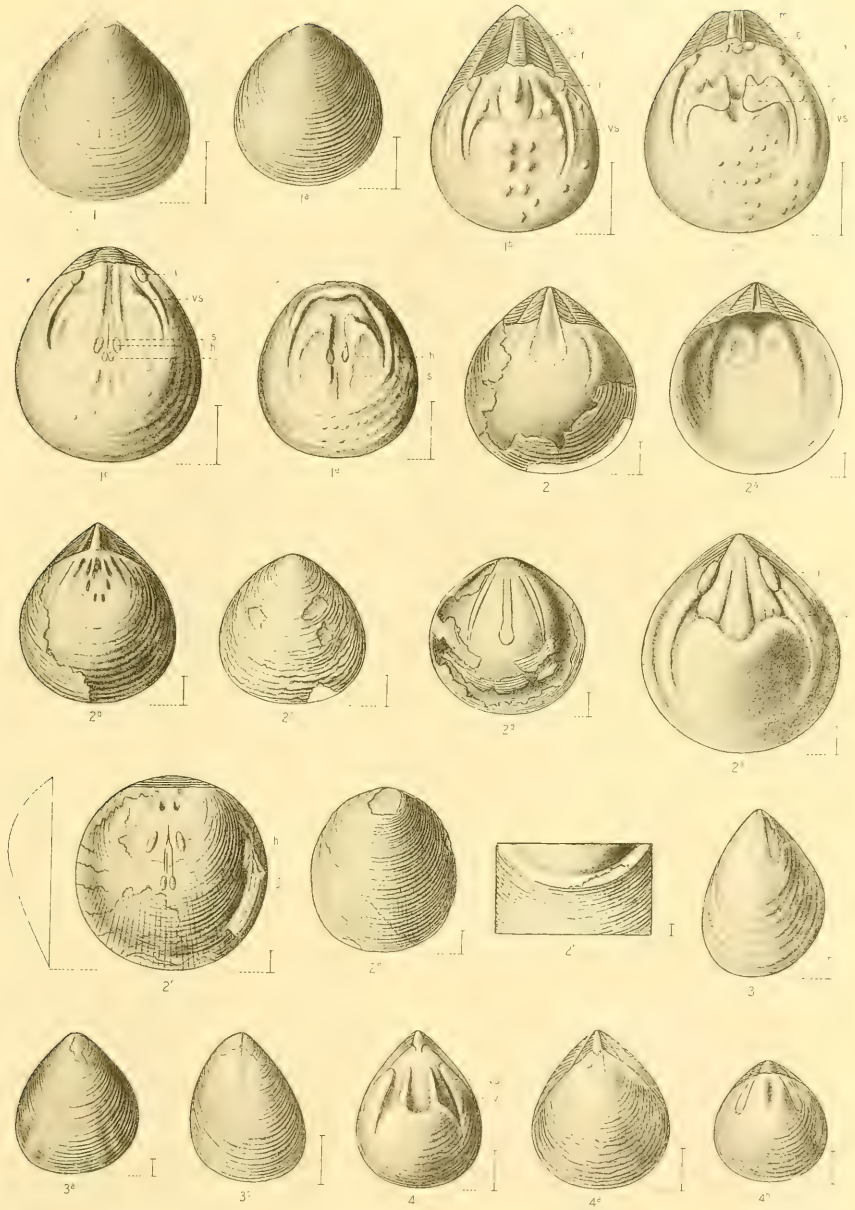
Figure 2e. Cast of an interior of a ventral valve. The strongly marked channel of the parietal scar and the elevated ridge in front of it is very characteristic of *Obolus apollinis* (Pl. VII). The posterior portion toward the area is restored from a second specimen. U. S. Nat. Mus. Cat. No. 51627a.

2f. Cast showing part of the interior of a dorsal valve, the type specimen. The anterior lateral scars are well shown on another specimen. U. S. Nat. Mus. Cat. No. 51627b.

2g. An elongate dorsal valve preserving the outer surface of the shell. U. S. Nat. Mus. Cat. No. 51627c.

2h. Enlargement of the anterior portion of a shell to illustrate the oblique lamellæ forming the strong shell. U. S. Nat. Mus. Cat. No. 51627d.

The specimens represented by figures 2e–h are from Locality **70**, Upper Cambrian limestone near Morgans Creek, Burnet County, Texas.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

LINGULELLA FRANKLINENSIS (Walcott) (p. 501).

FIGURE 3. Somewhat crushed ventral valve, the type, from which most of the shell has been exfoliated. Locality **87**, Lower Cambrian limestone near Highgate Falls, Franklin County, Vermont. U. S. Nat. Mus. Cat. No. 27318a.

3a. Dorsal (?) valve from the locality represented by figure 3, preserving the outer surface. This may be, however, a distorted ventral valve. U. S. Nat. Mus. Cat. No. 27318b.

3b. Largest ventral valve in the collection. Locality **28a**, Middle ? Cambrian, near Parker's quarry, Georgia, Vermont. U. S. Nat. Mus. Cat. No. 52454a.

LINGULELLA INO (Walcott) (p. 507).

FIGURE 4. Cast of the interior of a ventral valve, the type specimen, showing somewhat imperfectly the visceral cavity and main vascular sinuses. U. S. Nat. Mus. Cat. No. 27321a.

4a. Ventral valve preserving a portion of the shell, showing the area, pedicle groove, and flexure lines very clearly. U. S. Nat. Mus. Cat. No. 27321b.

4b. Cast of the interior of a dorsal valve, showing a relatively large area and portions of the shell adhering to the cast. U. S. Nat. Mus. Cat. No. 27321c.

The specimens represented are all from Locality **13b**, Middle Cambrian sandstones northeast of Rhea Springs, Roane County, Tennessee.

PLATE XXVII.

PLATE XXVII.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
g. Umbonal muscle scar.
h. Central muscle scar.
j. Anterior lateral muscle scar.
m. Pedicle muscle.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella prima (Conrad MS.) (Hall) (p. 526).

Figure 1. Cast of the interior of a ventral valve, showing the pestle-shaped ridge that filled the median groove of the interior of the shell. U. S. Nat. Mus. Cat. No. 27435a.

1a. Exterior of a ventral valve, showing rather strong undulations of growth. U. S. Nat. Mus. Cat. No. 27435

1b. Fragment of a ventral valve, showing the cast of the area, the divided umbonal muscle scar (g), and the pedicle scar (m). U. S. Nat. Mus. Cat. No. 27435c.

1c. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 27435d.

The specimens represented are all from Locality **77**, Upper Cambrian sandstone, Ausable Chasm, Essex County, New York.

Lingulella iris (Billings) (p. 509).

Figure 2. Dorsal valve, the type specimen, from Locality **319d**, Upper Cambrian, Point Levis, Quebec, Canada. Geol. Survey Canada. Redrawn from the specimen described and figured by Billings [1865a, p. 301, fig. 290] as *Lingula iris*.

Obolus prindlei (Walcott) (p. 409).

Figure 3. Ventral valve, the type, from Locality **72a**, Lower Cambrian, 1 mile southwest of Wynantskill, Rensselaer County, New York, showing the character of the outer surface and also of the surface of the inner layers where the shell is exfoliated over its umbonal portion. U. S. Nat. Mus. Cat. No. 27333a.

3a. Cast of the interior of a ventral valve which is broken away a little at the beak. This specimen is associated on the same hand specimen with the valve represented in figure 3. U. S. Nat. Mus. Cat. No. 27333b.

3b. Portion of a ventral valve from Locality **72a**, Lower Cambrian, 1 mile southwest of Wynantskill, Rensselaer County, New York, showing the cast of the finely punctate inner surface and the peculiar lamellose-like striæ of growth upon the area. U. S. Nat. Mus. Cat. No. 27333c.

3c. Cast of the interior of a dorsal valve, associated on the same hand specimen with the valve represented by figure 3, showing the area. U. S. Nat. Mus. Cat. No. 27333d.

3d. Exterior of a dorsal valve from Locality **72**, Lower Cambrian limestone 5 miles west of Albany, Rensselaer County, New York, illustrating the character of the outer surface. U. S. Nat. Mus. Cat. No. 27334a.

3e. Cast of the interior of a dorsal valve that is more convex and more oval in outline than the specimen represented by figure 3, which is associated on the same hand specimen with it. U. S. Nat. Mus. Cat. No. 27333e.

Obolus cyane (Billings) (p. 388).

Figure 4. Cast of the interior of a ventral valve, the type specimen, which preserves a portion of the inner layers of the shell over the visceral area.

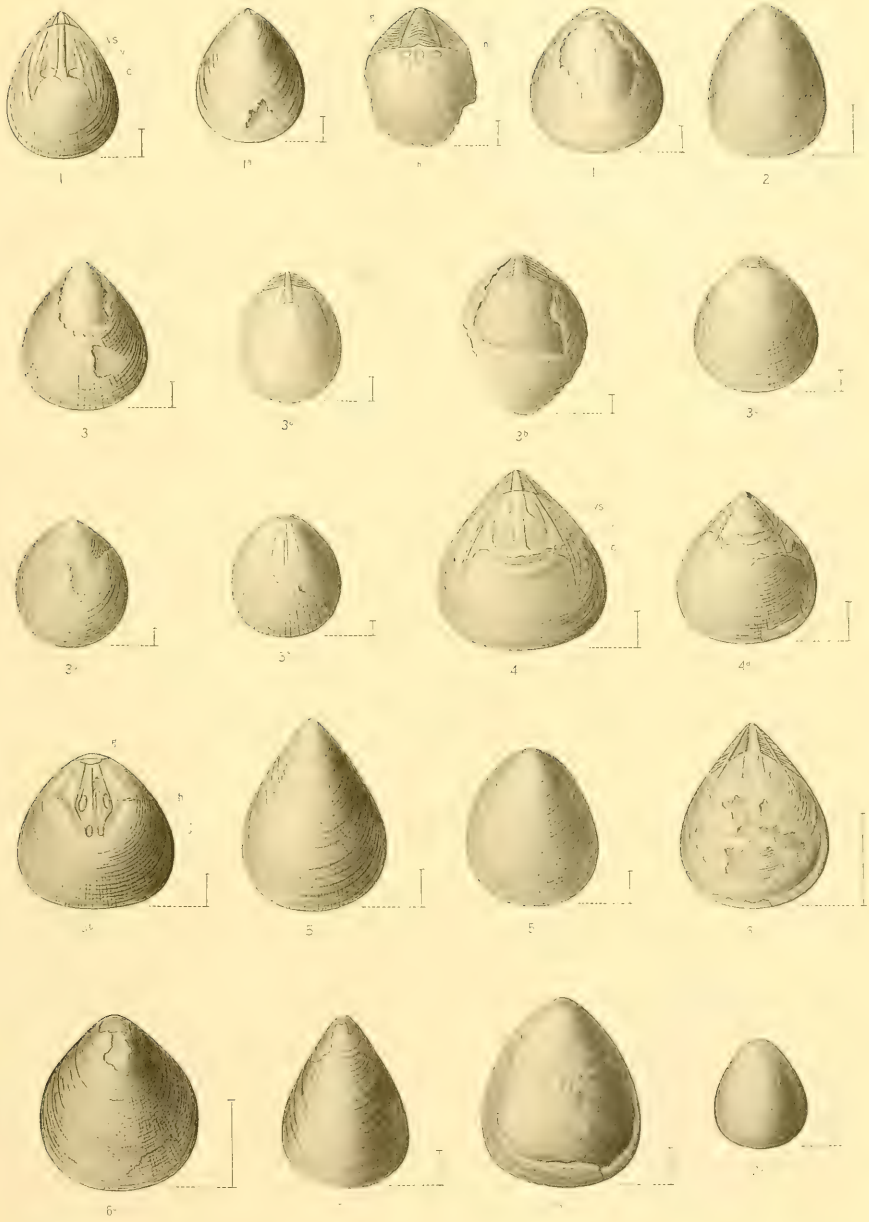
4a. Imperfect cast of a ventral valve, showing the lamellated shell structure.

4b. Cast of the interior of a dorsal valve. The muscle scars are obscured in the specimen from which the figure has been drawn, and those that appear in the figure are from another specimen occurring in the same fragment of limestone.

The specimens represented are all from Locality **314d**, Lower Ordovician limestone 4 miles northeast of Portland Creek, Newfoundland, and are now in the collections of the Geological Survey of Canada. These specimens were illustrated by Billings [1865a, figs. 20a–d, p. 215], but further identification of his figures with those in this monograph is impossible.

Lingulella iole (Billings) (p. 508).

Figures 5 and 5a. Ventral and dorsal valves, respectively, from Locality **314d**, Lower Ordovician limestone 4 miles northeast of Portland Creek, Newfoundland. Geol. Survey Canada. Redrawn from the two specimens figured by Billings [1865a, figs. 199a–e, p. 215] as *Lingula iole*. The ventral may be taken as the type.


1
1a
1b
1
2
3
3a
3b
3c
3d
3e
4
4a
5
5a
5b
5c
6
6a
6b
6c
FRANCES WIESER DEL.

LINGULELLA IRENE (Billings) (p. 508).

FIGURE 6. Interior of a flattened ventral valve, preserving the area and portions of the shell. The concentric striation of the exterior of the shell is shown at the place where the shell is broken away.

6a. Partly exfoliated outer surface of a dorsal valve that is compressed in the shale.

The specimens represented are both from Locality 312a, Lower Ordovician Levis shale at Point Levis, Quebec, Canada, and are in the collection of the Geological Survey of Canada. They were described and figured by Billings [1862d, pp. 71–72, figs. 64a–b] as *Lingula irene*. Figure 6 may be taken as the type.

LINGULELLA CUNEOLA (Whitfield) (p. 488).

FIGURE 7. Cast of a ventral valve from Locality 355, Middle Cambrian sandstone, Red Canyon Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No 24587a. Type specimen, figured by Whitfield [1880, Pl. I, fig. 6] as *Lingulepis cuneolus*. The specimen figured by Whitfield [1880, Pl. I, fig. 5] is not figured in this monograph.

7a. Cast of the interior of a ventral (?) valve, associated with the valve represented by figure 7, preserving a portion of the shell on the outer margins. U. S. Nat. Mus. Cat. No. 33873a.

7b. Cast of the interior of a dorsal valve, associated with specimens represented by figures 7 and 7a. U. S. Nat. Mus. Cat. No. 33873b.

PLATE XXVIII.

PLATE XXVIII.

a. Central lateral space of area.
a′. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
y. See text (p. 478).

Lingulella ampla (Owen) (p. 477).

Figure 1. Ventral valve partly broken away near the apex, from Locality **339e**, Middle Cambrian sandstone on Mountain Island, Minnesota. U. S. Nat. Mus. Cat. No. 17859b. Type specimen, figured by Owen [1852, Pl. IB, fig. 5] as *Lingula ampla*. The specimen represented by figure 12 of the same plate (Catalogue No. 17859a) is not figured in this monograph.

1a. Ventral valve, from Locality **84s**, Middle Cambrian sandstone near Dakota, Winona County, Minnesota. U. S. Nat. Mus. Cat. No. 35241a.

1b. Dorsal valve, associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35241b.

1c. Cast of the interior of a ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35241c.

1d. Cast of the interior of the ventral valve represented in figure 1f, enlarged. Locality **84s**, Middle Cambrian sandstone near Dakota, Winona County, Minnesota. U. S. Nat. Mus. Cat. No. 35241d.

1e. Cast of the interior of the posterior portion of a ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35241e.

1f. Cast of the interior of a ventral valve showing an unusual feature at *y*. This specimen is enlarged in figure 1d. U. S. Nat. Mus. Cat. No. 35241d.

1g. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35241f.

1h. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35241g.

1i. Enlargement of the area shown in figure 1h. U. S. Nat. Mus. Cat. No. 35241g.

1j. Ventral valve tentatively referred to this species, from Locality **88a**, Middle Cambrian limestone at Deadwood, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 51784a.

Obolus (Westonia) stoneanus (Whitfield) (p. 465).

[Pl. XLIX, figs. 2 and 2a.]

Figure 2. Cast of the interior of a compressed ventral valve. U. S. Nat. Mus. Cat. No. 51727a.

2a. Cast of the interior of a ventral valve, showing a few traces of the interior markings of the shell. U. S. Nat. Mus. Cat. No. 51727b.

2b. Enlargement of a cast of the area of a ventral valve. U. S. Nat. Mus. Cat. No. 51727c.

2c. Cast of the posterior portion of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51727d.

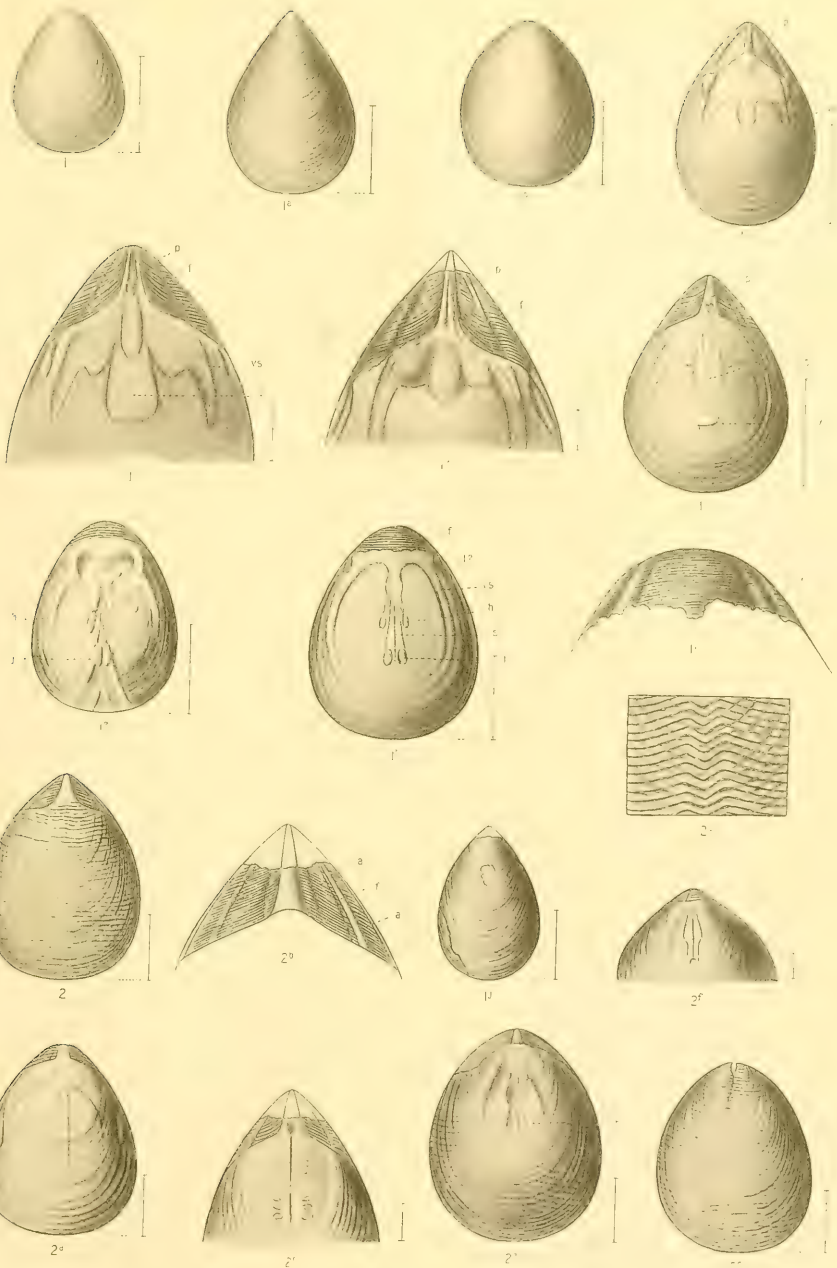
2d. Enlargement of a portion of the outer surface of a ventral valve. U. S. Nat. Mus. Cat. No. 51727e.

2e. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51727f.

2f. Posterior half of a cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51727g.

2g. Cast of the outer surface of a dorsal valve. U. S. Nat. Mus. Cat. No. 51727h.

The specimens represented are all from Locality **85s**, Upper Cambrian sandstone at Prairie du Sac, Sauk County, Wisconsin.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLATE XXIX.

PLATE XXIX.

h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella ferruginea Salter (p. 496).

[Pl. XXX, fig. 1; Pl. XXXI, figs. 3, 3a–c; and Pl. XXXV, figs. 4, 4a–b.]

Figure 1. Cast of the interior of a ventral valve compressed in the shale of Division 1c of Matthew [1886, p. 82], in New Brunswick (locality not given). University of Toronto, Canada. Specimen figured by Matthew [1886, Pl. V, fig. 9d] as *Lingulella dawsoni*.

1a. Ventral and dorsal valves from Locality **3011**, Middle Cambrian shales of Division 1d of Matthew on Porters Brook, St. John County, New Brunswick. University of Toronto, Canada. Specimens figured by Matthew [1886, Pl. V, figs. 8, 8a–b] as *Lingulella linguloides*.

1b and 1c. Ventral and dorsal valves shown in figure 1a. University of Toronto, Canada.

1d. Ventral valve from Locality **301k**, Middle Cambrian, St. John formation in St. John, New Brunswick. Cornell University, Ithaca, N. Y. Specimen figured by Walcott [1884a, Pl. V, fig. 8] as *Lingula? dawsoni*.

1e. Small exfoliated ventral valve from Locality **1a**, Middle Cambrian shale on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51757a.

1f. Distorted ventral valve from Locality **2**, Middle Cambrian shales on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 56997a.

1g. Cast of the exterior of a distorted ventral valve, associated with the specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 56997b.

1h. Interior of part of a dorsal valve, associated with specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 56997c.

1i. Slightly distorted dorsal valve associated with specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 56997d.

1j. Unusually convex and well-preserved ventral valve associated with specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 56997e.

1k. Exfoliated, slightly distorted ventral valve, associated with specimen represented by figure 1f. U. S. Nat. Mus. Cat. No. 56997f.

1l. Partly exfoliated ventral valve from the limestones interbedded in the shales of Locality **1**, Middle Cambrian, Manuels Brook, Conception Bay, Newfoundland. The peculiar appearance of what is shown of the interior of the shell is partly explained by figure 1o, which is compressed in the shale. U. S. Nat. Mus. Cat. No. 51756c.

1m. Ventral valve, associated with specimen represented by figure 1l. A portion of the outer surface is exfoliated so as to show the characteristic markings of the inner surface. U. S. Nat. Mus. Cat. No. 51756d.

1n. Cast of a dorsal valve showing the cast of a median septum and area, from Locality **1a**, Middle Cambrian sandy shale 50 feet lower in the section than specimens represented by figures 1l and 1m, on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51757b.

1o. Cast of the interior of a ventral valve showing the area of a portion of the visceral cavity. From Locality **1**, Middle Cambrian shale, Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51756a.

1p. Very nearly perfect dorsal valve, associated with the specimen represented by figure 1l. U. S. Nat. Mus. Cat. No. 51756e.

1q. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1l. U. S. Nat. Mus. Cat. No. 51756f.

1r. Interior of a dorsal valve, showing vascular sinus and median septum; also the ridges bounding the path of advance of the central scars. Associated with the specimen represented by figure 1l. U. S. Nat. Mus. Cat. No. 51756g.

1s. Cast of the interior of a dorsal valve from Locality **1**, Middle Cambrian shale on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51756b.

1t. Ventral valve, laterally compressed, preserving the fine surface markings described in the text. Collected from Locality **6g**, Middle Cambrian limestone, Chapple Arm, Trinity Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51759a.

1u. Cast showing part of the interior of a ventral valve from Locality **308**, Upper Cambrian shales of Division C3c of Matthew's section at Navy Island, St. John Harbor, New Brunswick. University of Toronto. The specimen represented by figure 1u was illustrated by Matthew [1892, Pl. XII, fig. 8b] as *Obolella? gemmula*.

FRANCES WIESER DEL.

LINGULELLA FERRUGINEA Salter—Continued.

FIGURE 1v. Cast showing part of the interior of a dorsal valve associated with the specimen represented by figure 1u. The outlines of a pedicle groove were produced by accidental fractures in the shell. University of Toronto. Specimen illustrated by Matthew [1892, Pl. XII, fig. 8c] as *Obolella? gemmula*.

1w. Compressed ventral valve associated with *Obolus refulgens* in Locality **308**, Upper Cambrian shales of Division C3c of Matthew's section, Navy Island, St. John Harbor, New Brunswick. University of Toronto.

2. Ventral ? valve from Locality **318h**, Middle Cambrian shales at St. Davids, South Wales. Copied from Hicks's figure [Salter and Hicks, 1867, fig. 2, p. 340] of *Lingulella ferruginea ovalis*.

2a. Enlarged view of the valve represented by figure 2. Copied from Salter and Hicks [1867, fig. 3, p. 340].

2b. Ventral valves from Locality **318j**, Middle Cambrian at Pen-y-pleidiau, St. Davids, South Wales. Copied from Salter's figure [Salter and Hicks, 1867, fig. 1, p. 340] of *Lingulella ferruginea*. It represents the type specimen.

2c. Ventral ? valve from Locality **318v**, Upper Cambrian, Rhiwfelyn, North Wales. Copied from Davidson [1868, Pl. XV, fig. 7a].

2d. Ventral valve from Locality **318u**, Upper Cambrian, Gwerny-y-Barcud, North Wales. Copied from Davidson [1868, Pl. XV, fig. 6a].

2e. Distorted ventral valve from Locality **366b**, Middle Cambrian at Porthclais Harbor, south of St. Davids, South Wales. Copied from Davidson [1871, Pl. XLIX, fig. 35a].

2f. Distorted ventral valve from Locality **318h**, Middle Cambrian Menevian shales at St. Davids, South Wales. Copied from Davidson [1871, Pl. XLIX, fig. 33a].

LINGULELLA BILLINGSIANA (Whiteaves) (p. 483).

FIGURES 3 and 3a. Ventral valves, from Locality **314a**, Upper Cambrian shales on Kelleys Island, Conception Bay, Newfoundland. Drawn from the type material in the Museum of the Geological Survey of Canada. Whiteaves [1878, p. 226] did not figure the specimens on which he based his species. Figure 3a may be taken as the type.

LINGULELLA BUTTSI Walcott (p. 484).

FIGURE 4. Dorsal valve, the type specimen, from Locality **90c**, Middle Cambrian Conasauga limestone near Kimbrel, Bibb County, Alabama, showing the slight median flattening of the surface and backward curvature of the concentric striæ. U. S. Nat. Mus. Cat. No. 51779a. Copied from Walcott [1908d, Pl. VIII, fig. 6].

4a and 4a′. Exterior view and side outline of ventral valve from Locality **90b**, Middle Cambrian Conasauga limestone near Woodstock, Bibb County, Alabama. U. S. Nat. Mus. Cat. No. 51778a.

4b and 4b′. Partly exfoliated ventral valve associated with the shell represented by figure 4a, showing the cast of the ridges along the path of advance of the muscle scars on each side of the visceral area. U. S. Nat. Mus. Cat. No. 51778b.

DELGADELLA LUSITANICA (Delgado) (p. 560).

FIGURE 5. Cast of the interior of a ventral valve, the type specimen. The marginal rim indicates the thickness of the shell.

5a. Cast of the interior of a ventral valve.

5b. Cast of a ventral valve.

The specimens represented are all from Locality **351**, Lower Cambrian shales at Monte de Valbom, northeast of Villa Boim, Province of Alemtejo, Portugal. The figures (5, 5a, and 5b) are reproduced from photographs sent to me by M. Delgado of the specimens figured by him [1904, Pl. IV, figs. 34, 31, and 32, respectively] under the name of *Lingulepis lusitanica*. Each of the views in this monograph is the reverse of the corresponding one given by Delgado.

LINGULELLA DELGADOI Walcott (p. 491).

FIGURE 6. Cast of exterior of ventral valve, the type specimen.

6a. Cast of interior of ventral valve.

Figures 6 and 6a are reproduced from photographs sent to me by M. Delgado of the specimens figured by him [1904, Pl. IV, figs. 16 and 18, respectively] under the name of *Lingulella granvillensis*.

FIGURE 6b. Cast of dorsal valve showing exterior surface. Reproduced from a photograph sent to me by M. Delgado of the specimen figured by him [1904, Pl. IV, fig. 27] under the name of *Lingulepis acuminata meeki*. The view in this monograph is the reverse of that given by Delgado.

6c. Cast of shell of dorsal valve partly broken away. Reproduced from a photograph sent to me by M. Delgado of the specimen figured by him [1904, Pl. IV, fig. 14] under the name of *Lingulella* cf. *linguloides*. The view in this monograph is the reverse of that given by Delgado.

The specimens represented by figures 6, 6a–c are from Locality **351**, Lower Cambrian shales at Monte de Valbom, northeast of Villa Boim, Province of Alemtejo, Portugal.

PLATE XXX.

PLATE XXX.

Lingulella ferruginea Salter? (p. 496).

[Pl. XXIX, figs. 1, 1a–w, 2, 2a–f; Pl. XXXI, figs. 3, 3a–c; and Pl. XXXV, figs. 4, 4a–b.]

Figure 1. Ventral valves from Locality **389d**, Upper Cambrian, at Iruya, Salta, Argentina. Copied from Kayser's figure [1897, Pl. VII, fig. 7] of *Lingulella* cf. *ferruginea*.

Lingulella davisi (McCoy) (p. 489).

[Pl. XXXI, figs. 6, 6a–h.]

Figure 2. Dorsal valve, from Locality **389d**, Upper Cambrian, at Iruya, Salta, Argentina. Copied from Kayser [1897, Pl. VII, fig. 6].

2a. Ventral and dorsal valves from Locality **332**, Upper Cambrian limestone at Saimaki, Liaotung, China. Copied from Kayser [1883, Pl. III, fig. 3].

Lingulella nicholsoni Callaway (p. 522).

Figure 3. Ventral valve, the type specimen, from Locality **304i**, Upper Cambrian Shineton shales in South Shropshire, England. Copied from Callaway [1877, Pl. XXIV, fig. 11].

3a. Enlargement of the area of a ventral valve from one of the localities mentioned in Locality **304i**, South Shropshire, England. Copied from Callaway [1877, Pl. XXIV, fig. 11b].

3b. Dorsal valve with outer shell exfoliated except over the area. U. S. Nat. Mus. Cat. No. 51748a.

3c. Exfoliated dorsal valve. The central and transmedian muscle scars are drawn from another specimen. U. S. Nat. Mus. Cat. No. 51748b.

3d. A small ventral valve showing outline of area. U. S. Nat. Mus. Cat. No. 51748c.

3e. A small elongate dorsal valve. U. S. Nat. Mus. Cat. No. 51748d.

3f. A small ventral valve resting on the dorsal valve which has been pushed backward out of its natural position. U. S. Nat. Mus. Cat. No. 51748e.

The specimens represented by figures 3b–f are from Locality **304 l**, Upper Cambrian Shineton shale, on Shineton Brook and vicinity, South Shropshire, England.

Lingulella cf. ferruginea (p. 500).

Figure 4. Ventral valve from Locality **345**, Middle Cambrian shale on the Dlouhá Hora, near Skrej, Bohemia. Copied from Pompeckj's figure [1896b, Pl. XIV, figs. 16a–b] of "*Lingulella* (*?*) sp."

Lingulella kiurensis (Waagen) (p. 511).

Figure 5. Type specimen of Waagen's species "*Lingula warthi*." Geol. Survey India Cat. No. 3/795. Specimen figured by Waagen [1885, Pl. LXXXVI, figs. 9a–b] as *Lingula* (*?*) *warthi*. The same specimen is figured by Waagen [1891, Pl. II, figs. 17a–b] as *Lingula* (*?*) *kiurensis*, but from his description [1885, pp. 769–770] this is the form to which he intended to give the name *warthi*. I think it is the dorsal valve of *Lingulella kiurensis*.

5a. Copy of the figures given by Waagen [1891, Pl. II, figs. 17a–b] of the specimen represented by figure 5. The cardinal slopes are crushed in, which gives the depressed slopes described by Waagen [1885, p. 769]. The front is also restored.

6. Type specimen of *Lingula* (*?*) *kiurensis* Waagen. Geol. Survey India Cat. No. 3/794. Specimen figured by Waagen [1885, p. 768, Pl. LXXXVI, figs. 8a–b] as *Lingula* (*?*) *kiurensis*. The same specimen is figured by Waagen [1891, Pl. II, figs. 18a–b] as *Lingula* (*?*) *warthi*, but from his description [1885, p. 768] this is the form to which he intended to give the name *kiurensis*.

6a. Copy of the figures given by Waagen [1891, Pl. II, figs. 18a–b] of the specimen represented in figure 6. The front of the shell is restored in Waagen's figures, and the cardinal slopes widened out so as to make a diagrammatic figure.

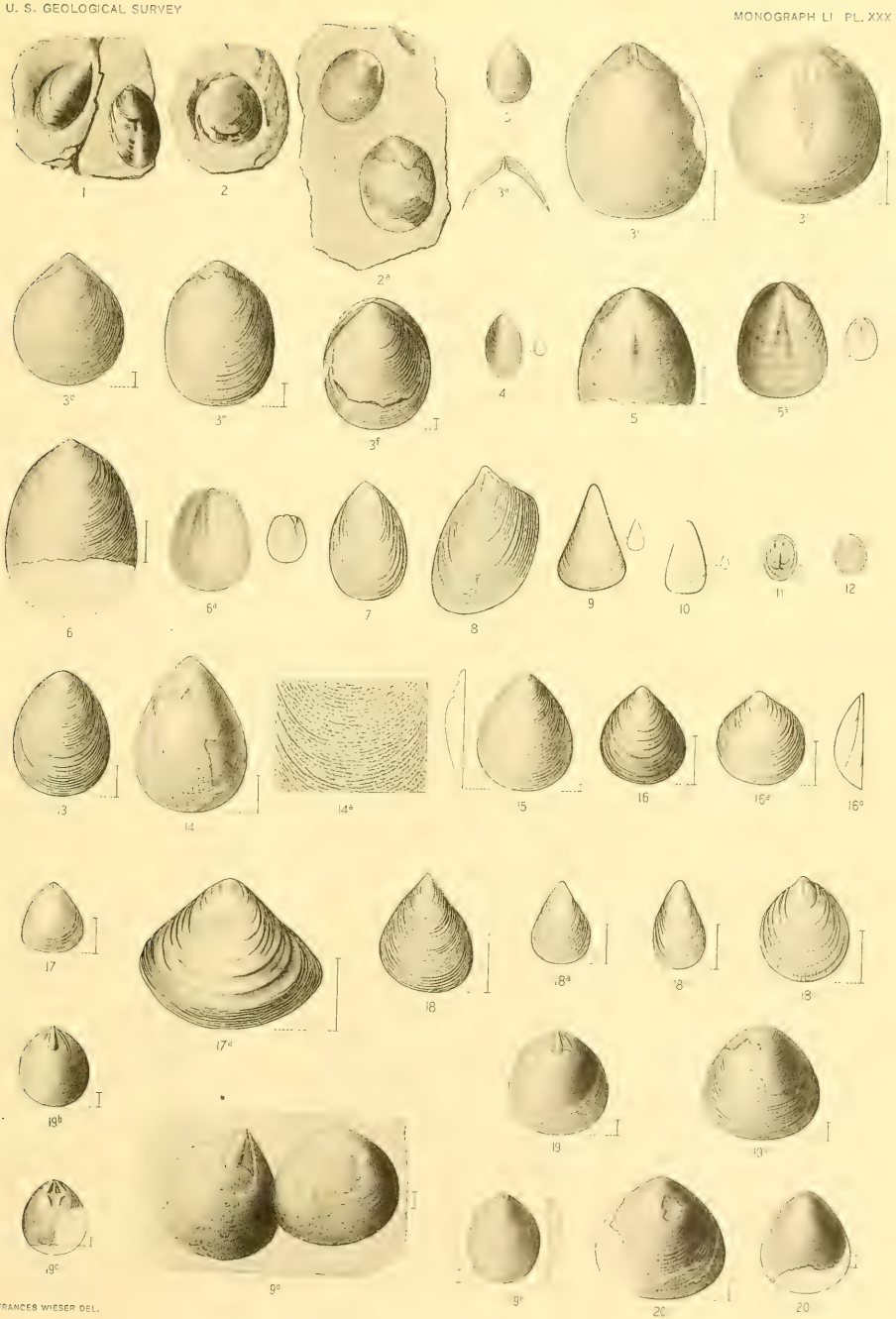
The specimens represented are both from Locality **357**, Middle Cambrian limestones in the *Neobolus* beds of the Khussak group, near Kiura, Salt Range, India.

Lingulella wirthi (Barrande) (p. 541).

Figure 7. Ventral valve from Locality **303c**, passage beds between the Upper Cambrian and Ordovician near Hof, Bavaria. Enlarged one-third. Type specimen, copied from Barrande [1868a, fig. 63].

Lingulella cedens (Barrande) (p. 485).

Figure 8. Ventral valve from Locality **303c**, passage beds between the Upper Cambrian and Ordovician near Hof, Bavaria. Enlarged one-third. Type specimen, copied from Barrande [1868a, fig. 66].



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON.

LINGULELLA? (LINGULEPIS?) SQUAMOSA (Holl) (p. 559).

FIGURE 9. Ventral valve from Locality **304g**, Upper Cambrian Hollybush sandstones, Malvern Hills, England. Copied from Davidson's figure [1866, Pl. II, fig. 7] of *Lingula squamosa*.

LINGULELLA (LINGULEPIS?) PYGMÆA (Salter) (p. 556).

FIGURE 10. Ventral? valve from Locality **304f**, Upper Cambrian "Black shales," Malvern Hills, England. Copied from Salter [1865, figs. 8a–b, p. 101].

LINGULELLA SIGNATA (Barrande) (p. 532).

FIGURE 11. Dorsal? valve from Locality **303c**, passage beds between the Upper Cambrian and Ordovician near Hof, Bavaria. Enlarged one-third. Copied from Barrande [1868a, fig. 73].

LINGULELLA? HUMILLIMA (Barrande) (p. 507).

FIGURE 12. Dorsal valve from Locality **303c**, passage beds between the Upper Cambrian and Ordovician near Hof, Bavaria. Enlarged one-third. Copied from Barrande [1868a, fig. 70].

LINGULELLA sp. undt. a Walcott (p. 541).

FIGURE 13. Dorsal valve from Locality **310k**, Upper Cambrian limestone on Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 51749a.

LINGULELLA LINNARSSONI (Walcott) (p. 516).

FIGURE 14. Ventral valve, the type specimen, with the outer shell partly exfoliated. U. S. Nat. Mus. Cat. No. 35257a.

14a. Enlargement of the exterior surface on the anterior portion of a ventral valve. U. S. Nat. Mus. Cat. No. 35257b.

The specimens represented are both from Locality **320n**, Middle Cambrian limestone at Lovened, Djupadal, Province of Skaraborg, Sweden.

LINGULELLA AGNOSTORUM (Wallerius) (p. 476).

FIGURE 15. Ventral valve greatly enlarged, and longitudinal outline of valve, from Locality **310i**, passage beds between the Middle and Upper Cambrian, at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 51747a.

OBOLUS? ZOPPI Walcott (p. 422).

FIGURE 16. Ventral valve, the type specimen, from Locality **354f**, Middle Cambrian sandstone near Canal Grande, on the road to Punta Pintau, Sardinia, Italy. Copied from Bornemann [1891, Pl. XIX, fig. 17a].

16a. Dorsal valve associated with the shell represented by figure 16. Copied from Bornemann [1891, Pl. XIX, fig. 16].

16b. Side view of the shell represented in figure 16. Copied from Bornemann [1891, Pl. XIX, fig. 17b].

OBOLUS? MENEGHINII Walcott (p. 403).

FIGURE 17. A small exfoliated ventral valve, the type specimen, from Locality **354c**, Middle Cambrian sandstone at Punta Pintau (Canal Grande), Sardinia. Copied from Bornemann's figure [1891, Pl. XIX, fig. 14a] of *Lingula petalon*.

17a. A large ventral valve from Locality **354e**, Middle Cambrian shale at Porto Canal Grande, Sardinia. Copied from Bornemann's figure [1891, Pl. XIX, fig. 18] of *Obolella* sp.

LINGULELLA BORNEMANNI (Walcott) (p. 483).

FIGURES 18, 18a, and 18b. More or less distorted and compressed ventral valves from Locality **354**, Middle? Cambrian, Canal Grande, Sardinia.

Figures 18, 18a, and 18b are copied from Bornemann's figures [1891, Pl. XIX, figs. 10a, 4, and 8, respectively] of *Lingula attenuata*. Figure 18 represents the type specimen.

FIGURE 18c. Dorsal? valve from Locality **354**, Middle? Cambrian, Canal Grande, Sardinia. Copied from Bornemann's figure [1891, Pl. XIX, fig. 7] of *Lingula attenuata*.

OBOLUS SCHMALENSEEI (Walcott) (p. 412).

FIGURE 19. Broad form of the ventral valve, showing cast of pedicle furrow and a portion of the visceral cavity. U. S. Nat. Mus. Cat. No. 35291a.

19a. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 35291b.

19b. An elongate ventral valve. U. S. Nat. Mus. Cat. No. 35291c.

19c. Cast of a dorsal valve, showing the strongly marked area and margins of the posterior portion of the visceral cavity. U. S. Nat. Mus. Cat. No. 35291d.

19d. Partly exfoliated ventral and dorsal valves, the type specimen. U. S. Nat. Mus. Cat. No. 35291e.

19e. A small ventral valve. U. S. Nat. Mus. Cat. No. 35291f.

The specimens represented are all from Locality 8w, Middle Cambrian limestone at Andrarum, Province of Christianstad, Sweden.

ELKANIA IDA (Billings) (p. 563).

[Pl. LI, figs. 4, 4a–c.]

FIGURE 20. A probable ventral valve, from Locality 319, Lower Ordovician limestone of No. 1 of Billings's section, Point Levis, Quebec, Canada. Geol. Survey Canada.

20a. Dorsal valve from the locality represented by figure 20. Geol. Survey Canada.

PLATE XXXI.

PLATE XXXI.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella nathorsti Linnarsson (p. 521).

Figure 1. Cast of the interior of ventral valve, from Locality **320x**, Lower Cambrian limestone at Andrarum, Province of Christianstad, Sweden. U. S. Nat. Mus. Cat. No. 18199a.

1a and 1b. Casts of the interior of dorsal valves associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 18199b and 18199c, respectively.

1c. Ventral valve preserving most of the shell, from Locality **8y**, Lower Cambrian limestone at Skårösen, Dalarne, Sweden. U. S. Nat. Mus. Cat. No. 51739a.

1d and 1e. Dorsal valves associated with the ventral valve represented by figure 1c. U. S. Nat. Mus. Cat. Nos. 51739b and 51739c, respectively.

1f. Ventral valve associated with the ventral valve represented by figure 1c. U. S. Nat. Mus. Cat. No. 51739d.

1g and 1h. Dorsal valves associated with the ventral valve represented by figure 1c. U. S. Nat. Mus. Cat. Nos. 51739e and 51739f, respectively.

Lingulella siemiradzkii (Walcott) (p. 531).

Figure 2. Ventral valve, the type specimen, showing portion of the outer surface and the finely striated inner layer of shell. U. S. Nat. Mus. Cat. No. 35258a.

2a. Cast of part of a dorsal valve. U. S. Nat. Mus. Cat. No. 35258b.

The specimens represented are both from Locality **368**, Middle Cambrian quartzitic sandstones in the Pepper Mountains, near Sandomierz, on the Vistula, Russian Poland.

Lingulella ferruginea Salter (p. 496).

[Pl. XXIX, figs. 1, 1a–w, 2, 2a–f; Pl. XXX, fig. 1; and Pl. XXXV, figs. 4, 4a–b.]

Figure 3. Ventral valve from Locality **310p**, Middle Cambrian limestone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 51752a.

3a. Dorsal valve from Locality **310y**, Middle Cambrian limestone of Kiviks Esperöd, Province of Malmöhus, Sweden. U. S. Nat. Mus. Cat. No. 18205a.

3b. Short ventral valve from Locality **310z**, Middle Cambrian limestone at Brantevik, Sweden, that is doubtfully referred to this species. U. S. Nat. Mus. Cat. No. 51750a.

3c. Ventral valve doubtfully referred to the species from Locality **320m**, Middle Cambrian at Kinnekulle, Province of Skaraborg, Sweden. Copied from Linnarsson's figure [1876, Pl. III, fig. 28] of "*Lingula* or *Lingulella* sp."

Lingulella lepis (Salter) (p. 514).

Figure 4. Ventral valve from Locality **366k**, Upper Cambrian shales, Penmorfa, Merionethshire, North Wales. Enlarged drawing of the specimen represented in figure 4a. Copied from Davidson [1871, Pl. XLIX, fig. 31a].

4a. The ventral valve figured in figure 4, natural size. Copied from Davidson [1871, Pl. XLIX, fig. 31].

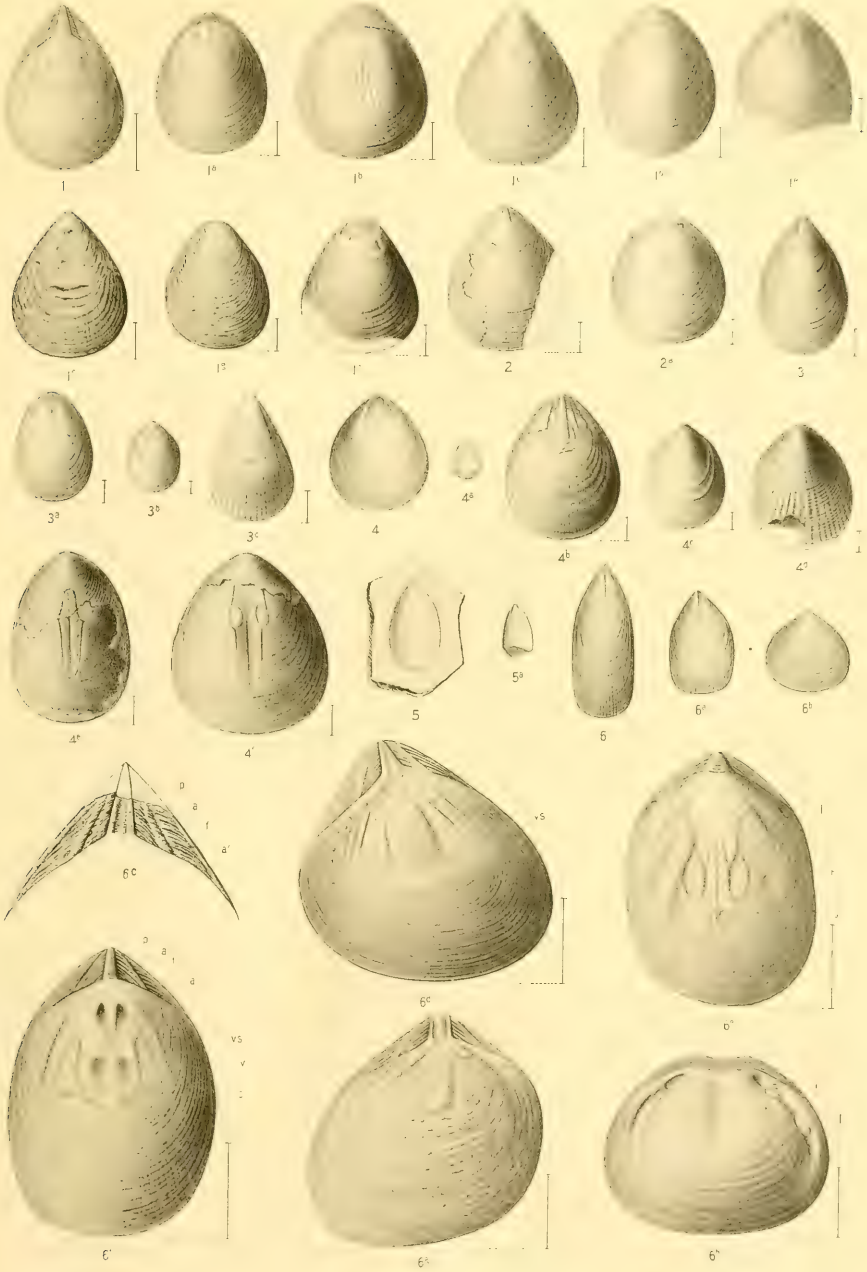
4b. Cast of the interior of a ventral valve from Locality **8x**, passage beds between the Upper Cambrian and the Ordovician, at Slemmestad, near Christiania, Norway, showing area, cast of pedicle groove, and visceral cavity. U. S. Nat. Mus. Cat. No. 51741a.

4c. Exterior of a strongly convex, highly polished ventral valve associated with the shell represented in figure 4b. Traces of radiating ribs, so strongly developed in figure 4d, are visible with a strong lens. U. S. Nat. Mus. Cat. No. 51741b.

4d. Dorsal valve associated with the shell represented in figure 4b, marked by strong radiating ribs and fine concentric striæ. U. S. Nat. Mus. Cat. No. 51741c.

4e. Narrow form of dorsal valve, showing outline of elongate visceral cavity, from Locality **9f**, Upper Cambrian limestones at Nœrsnæs, west of Christiania, Norway. U. S. Nat. Mus. Cat. No. 51742a.

4f. Cast of part of a broad form of a dorsal valve associated with the shell represented by figure 4b. U. S. Nat. Mus. Cat. No. 51741d.



FRANCES WIESER DEL.

Lingulella? primæva Hicks (p. 527).

Figures 5 and 5a. Ventral? valves from the Middle? Cambrian Caerfai group (see Locality **366c**), south of St. Davids, South Wales. Copied from Davidson [1883, Pl. XVII, figs. 34 and 33, respectively]. Figure 5a represents the type specimen, Davidson's figure being a copy of the one given by Hicks [1871, Pl. XV, fig. 14].

Lingulella davisi (McCoy) (p. 489).

[Pl. XXX, figs. 2 and 2a.]

Figures 6 and 6a. Distorted ventral valves from "*Lingula* flags, Penmorfa, Tremadoc" (see localities **366k** and **366l**), Merionethshire, North Wales. Copied from Davidson [1866, Pl. IV, figs. 10 and 11, respectively].

6b. Distorted ventral valve from Locality **317b**, Middle Cambrian, at Bellewstown, County Meath, Ireland. Copied from Davidson [1866, Pl. IV, fig. 12].

6c. Enlargement of the area of a cast of a ventral valve from Locality **366a**, Upper Cambrian shales, 6 miles east of Ffestiniog, Merionethshire, North Wales. U. S. Nat. Mus. Cat. No. 51740a.

6d. Cast of the interior of a distorted ventral valve associated with the specimen represented by figure 6c. U. S. Nat. Mus. Cat. No. 51740b. Specimen figured by Walcott [1898b, Pl. XXVII, fig. 2] as *Obolus* (*Lingulella*) *davisii*.

6e. Cast of the interior of a dorsal valve, showing the characteristic muscle scars of the genus. Locality **366n**, Upper Cambrian shales at Portmadoc, Merionethshire, North Wales. U. S. Nat. Mus. Cat. No. 35239a. Specimen figured by Walcott [1898b, Pl. XXVII, fig. 4] as *Obolus* (*Lingulella*) *davisii*.

6f. Cast of the interior of a ventral valve associated with the shell represented in figure 6e, showing the outlines of the visceral cavity and the vascular sinuses. U. S. Nat. Mus. Cat. No. 35239b. Specimen figured by Walcott [1898b, Pl. XXVII, fig. 1] as *Obolus* (*Lingulella*) *davisii*.

6g. Cast of the interior of a ventral valve in which the characteristic punctate surface of the interior of the shell is shown by the large papillæ scattered over the surface. Locality **366a**, Upper Cambrian shales 6 miles east of Ffestiniog, Merionethshire, North Wales. U. S. Nat. Mus. Cat. No. 51740c.

6h. Cast of a distorted dorsal valve associated with the shell represented in figure 6g, preserving the impressions of the transmedian and outside lateral muscle scars. U. S. Nat. Mus. Cat. No. 51740d. Specimen figured by Walcott [1898b, Pl. XXVII, fig. 5] as *Obolus* (*Lingulella*) *davisii*.

PLATE XXXII.

PLATE XXXII.

h. Central muscle scar. j. Anterior lateral muscle scar.

Lingulella davidsoni (Barrande) (p. 489).

Figure 1. Partly exfoliated ventral valve, the type specimen, showing lamellated shell, from Locality **303m**, Ordovician, Étage d4, at Lieben, Bohemia. Enlarged one-third. Copied from Barrande [1879b, Pl. CIV, fig. VIII:1A].

1a. Side view of the specimen represented by figure 1. Copied from Barrande [1879b, Pl. CIV, fig. VIII:1b].

1b. Less elongate ventral valve than that represented by figure 1, from Locality **303n**, Ordovician, Étage d4, at Wraž, Bohemia. Enlarged one-third. Copied from Barrande [1879b, Pl. CIV, fig. VIII:3A].

1c. Side view of the specimen represented by figure 1b. Copied from Barrande [1879b, Pl. CIV, fig. VIII:3b].

1d. Enlargement of the area and posterior portion of figure 1e. Copied from Barrande [1879b, Pl. CIV, fig. VIII:4E].

1e. Interior of a ventral valve from Locality **303o**, Ordovician, Étage d4, at Lodenitz, Bohemia. Copied from Barrande [1879b, Pl. CIV, fig. VIII:4].

Lingulella? insons (Barrande) (p. 508).

Figure 2. Interior of ventral valve from Locality **303d**, Lower Ordovician, Étage d1, at Swarow, Bohemia. Copied from Barrande [1879b, Pl. CV, fig. X:4A].

2a. Partly exfoliated dorsal valve from same bed as specimen represented by figure 2. Copied from Barrande [1879b, Pl. CV, fig. X:3A].

2b and 2c. Interior of ventral valves, showing area, from Locality **303e**, Lower Ordovician, Étage d1, at Sta. Benigna, Bohemia. Copied from Barrande [1879b, Pl. CV, figs. X:5A and X:6A, respectively]. Figure 2c represents the type specimen.

2d. Enlargement of the area of figure 2c. Copied from Barrande [1879b, Pl. CV, fig. X:6E].

2e. Enlargement of surface of shell and impression of interior surface from the anterior portion of the valve. Locality **303d**, Lower Ordovician, Étage d1, at Swarow, Bohemia. Copied from Barrande [1879b, Pl. CV, fig. X:1f].

Lingula? eximia Barrande (p. 301).

Figure 3. Fragment of the shell greatly enlarged to show complex character of the surface ornamentation. Inserted for comparison. Locality **303l**, Lower Ordovician, Étage d1, at Libetschov, Bohemia. Copied from Barrande [1879b, Pl. CV, fig. I:f].

Lingulella? simplex (Barrande) (p. 534).

Figure 4. Ventral valve showing portion of area where the thin shell has been pressed down into it. Locality **303p**, Lower Ordovician, Étage d3, near Beraun, Bohemia. Copied from Barrande [1879b, Pl. CIV, fig. VI:1A].

4a. Dorsal valve from Locality **303a**, Lower Ordovician, Étage d3, at Trubin, Bohemia. Copied from Barrande [1879b, Pl. CIV, fig. VI:4A].

4b. Side view of specimen represented by figure 4a. Copied from Barrande [1879b, Pl. CIV, fig. VI:4B].

Obolus (Palæobolus) bretonensis (Matthew) (p. 426).

Figure 5. Cast of the interior of a flattened ventral valve, the type specimen, slightly compressed laterally. University of Toronto, Canada. Reproduced from a photograph of one of Matthew's specimens; it may be the one used by him in drawing figure 2b of his paper [1903, Pl. IX], but closer identification is impossible.

5a. Cast of part of the interior of a ventral valve. University of Toronto, Canada.

5b. Exterior of a nearly entire dorsal valve. University of Toronto, Canada. Reproduced from a photograph of one of Matthew's specimens; it may be the one used by him in drawing figure 2d of his paper [1903, Pl. IX].

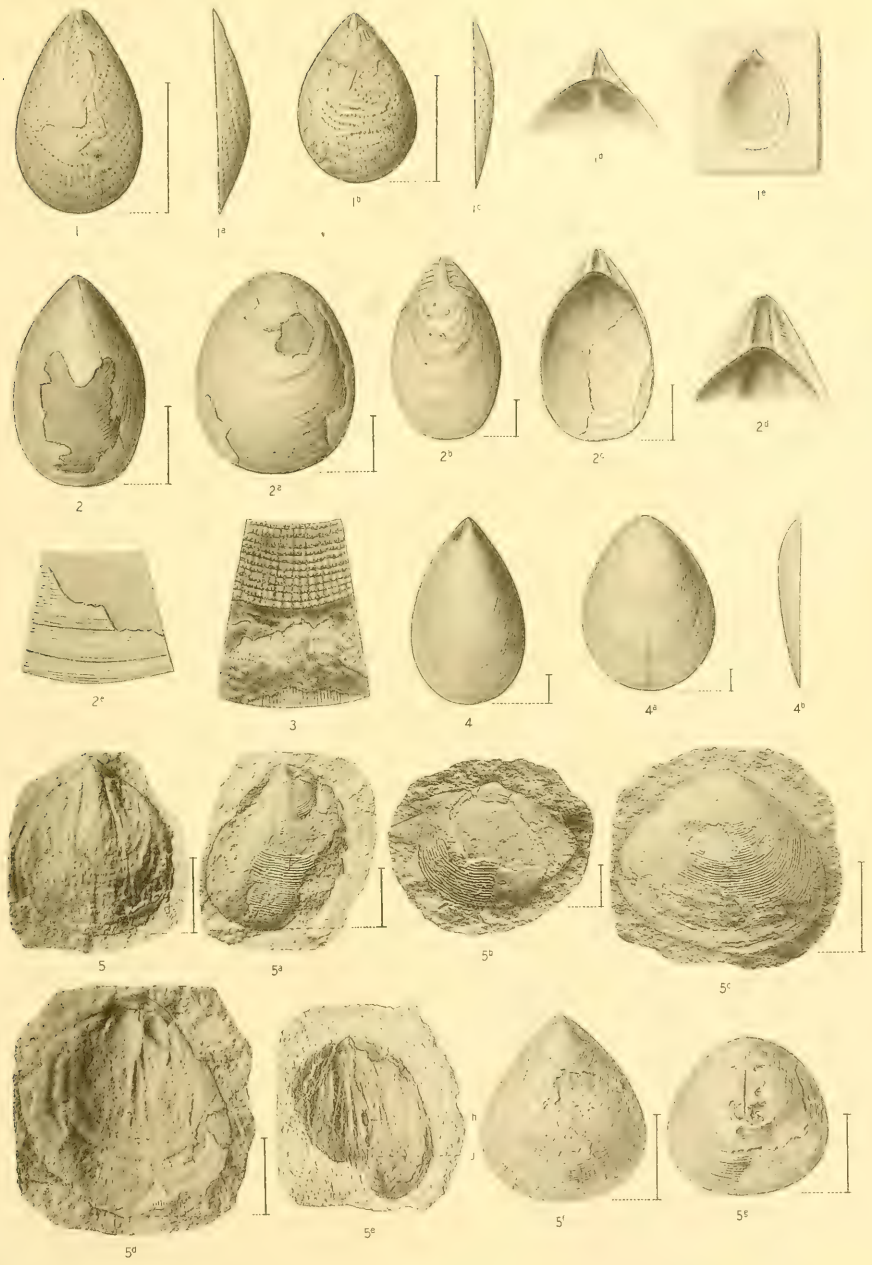
5c. Exterior of a dorsal valve, showing finely preserved outer surface. University of Toronto, Canada. Reproduced from a photograph of one of Matthew's specimens; it may be the one used by him in drawing figure 2a of his paper [1903, Pl. IX].

5d. Cast of part of a broken dorsal valve in which the area is preserved. University of Toronto, Canada.

5e. Enlargement of a cast of the interior of a dorsal valve. University of Toronto, Canada. Reproduced from a photograph of one of Matthew's specimens; it may be the one used by him in drawing figure 2e of his paper [1903, Pl. IX].

The exact locality represented by the specimens figured is not known. It is probable, however, that they were all collected at the type locality (**344b**), Middle Cambrian shales of Division E3d of Matthew's Etcheminian, Dugald Brook, Cape Breton, Nova Scotia.

Figures 5f and 5g. Exterior of nearly perfect ventral and dorsal valves, from Locality **10p**, Middle Cambrian sandstones of Division E2b of Matthew on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 51664a and 51664b, respectively.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE XXXIII.

PLATE XXXIII.

Lingulella lens (Matthew) (p. 512).

Figure 1. Ventral valve broken and embedded in limestone. University of Toronto, Canada. Type specimen, figured by Matthew [1901, Pl. V, fig. 3a] as *Lingula? lens*.

1a. Ventral valve showing outline of a smaller shell than that represented by figure 1. U. S. Nat. Mus. Cat. No. 51767a.

1b, 1c, and 1d. Partly exfoliated dorsal valves varying somewhat in outline and size. U. S. Nat. Mus. Cat. Nos. 51767b, 51767c, and 51767d, respectively.

The specimens represented are all from Locality **10r**, Upper Cambrian shales of Division C3a? of Matthew, at McAdam Shore, East Bay, Cape Breton, Nova Scotia.

Lingulella concinna Matthew (p. 486).

[Pl. XXXIV, figs. 1, 1a-r.]

Figure 2. Ventral valve broadened by movement in the fine shale of Locality **3h**, Upper Cambrian, McNeil Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51762s.

2a. Ventral valve that occurs on the same hand specimen with the shell represented by figure 2. It has been elongated by the movement which broadened figure 2. U. S. Nat. Mus. Cat. No. 51762t.

2b. Ventral valve associated with the shell represented by figure 2, preserving its original outline. U. S. Nat. Mus. Cat. No. 51762u. (See note following description of fig. 2h.)

2c. Small dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 51762v.

2d. Dorsal valve, the type specimen, slightly broadened by compression; from Locality **307**, Upper Cambrian, McLeod Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Drawn from one of the specimens figured by Matthew [1901, Pl. V, figs. 2a-b], but closer identification is impossible.

2e. Dorsal valve associated with the specimen represented by figure 2, slightly broadened by compression. U. S. Nat. Mus. Cat. No. 51762w.

2f. Dorsal valve associated with the specimen represented by figure 2, more or less distorted by compression in the shale. U. S. Nat. Mus. Cat. No. 51762x.

2g. Distorted dorsal valve from Locality **372**, Upper Cambrian shale at Upper Leitches Creek, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52449a.

2h. Dorsal valve associated with the ventral valve represented by figures 2 and 2b. U. S. Nat. Mus. Cat. No. 51762y. Figures 2b and 2h preserve the original convexity and outline of the shell more perfectly than those compressed in the fine shales.

Obolus (Westonia) ella (Hall and Whitfield) (p. 455).

[Pl. XLVII, figs. 1, 1a-p.]

Figures 3 and 3a. Associated dorsal valves distorted by movement in shale, one being broadened, and the other elongated. U. S. Nat. Mus. Cat. Nos. 51684a and 51684b, respectively.

3b and 3c. Dorsal and ventral valves compressed and distorted in fine shale. U. S. Nat. Mus. Cat. Nos. 51684c and 51684d, respectively.

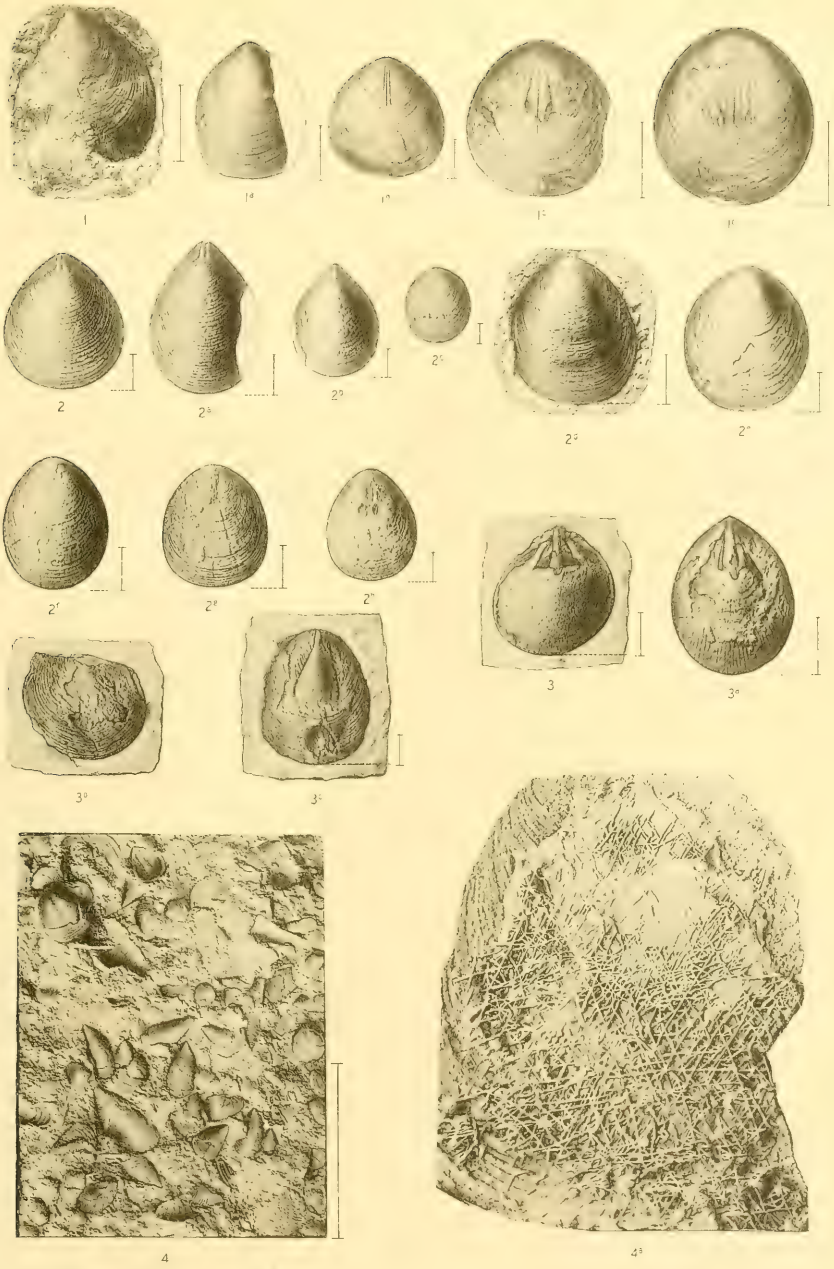
The figures all represent specimens from Locality **3c**, Middle Cambrian shales near Ophir, Utah, and are introduced to illustrate the forms this species may often take where the fine shells have been more or less compressed and stretched. They should be compared with the prevailing form of the species as shown on Plate XLVII.

Lingulella (Lingulepis) exigua (Matthew) (p. 551).

[Pl. XLIII, figs. 1, 1a-z.]

Figure 4. Group of young shells occurring in fine, arenaceous shale, Locality **3i**, Middle Cambrian on McLean Brook, 1.5 miles west of Marion Bridge, Cape Breton, Nova Scotia, in which the adult specimens represented on Plate XLIII occur. U. S. Nat. Mus. Cat. No. 34761s.

4a. Specimen in which the substance of the shell has been etched by acid so as to leave in relief the siliceous matter filling the fractures in the shell. Locality **10s**, Middle Cambrian sandstone on McLean Brook, near Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52468a. The original specimen is 12 mm. in length. The system of fractures is very complicated within the two main lines of fracture which cross each other obliquely, forming rhomboidal spaces.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

No.....
PROPERTY OF
THE TOWN OF MONTAGUE
CARNEGIE PUBLIC LIBRARY

PLATE XXXIV.

PLATE XXXIV.

Lingulella concinna Matthew (p. 486).

[Pl. XXXIII, figs. 2, 2a–h.]

Figure 1. This ventral valve is somewhat doubtfully referred to this species. The specimen from which the figure was drawn occurs in Locality **310h**, Upper? Cambrian shales in the Province of Skåne, Sweden, and is more nearly related to some forms of *Lingulella concinna* than to other species from the Upper Cambrian and Lower Ordovician. U. S. Nat. Mus. Cat. No. 14932a.

1a–h. Ventral valves illustrating variations in outline, convexity, etc., from Locality **3h**, Upper Cambrian shale on McNeil Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 51762a–h, respectively.

1i–q. Dorsal valves associated with the ventral valves represented by figures 1a–h. U. S. Nat. Mus. Cat. Nos. 51762i–q, respectively.

1r. Three ventral valves and fragments of a dorsal valve associated with the shells represented by figures 1a–q (× 2). U. S. Nat. Mus. Cat. No. 51762r.

Obolus septalis (Walcott) (p. 414).

[Pl. XXIII, fig. 3d.]

Figure 2. Exterior of dorsal valve. Collection of Mr. Byron E. Walker, Toronto, Canada.

2a. Cast of interior of dorsal valve, the type specimen. U. S. Nat. Mus. Cat. No. 51612a.

The specimens are both from Locality **14s**, Middle Cambrian *Ogygopsis* zone on Mount Stephen, British Columbia.

Lingulella (Lingulepis) acuminata (Conrad) (p. 545).

[Pl. XL, figs. 1, 1a–s; Pl. XLI, figs. 1, 1a–n; and Pl. XLII, figs. 1, 1a–o.]

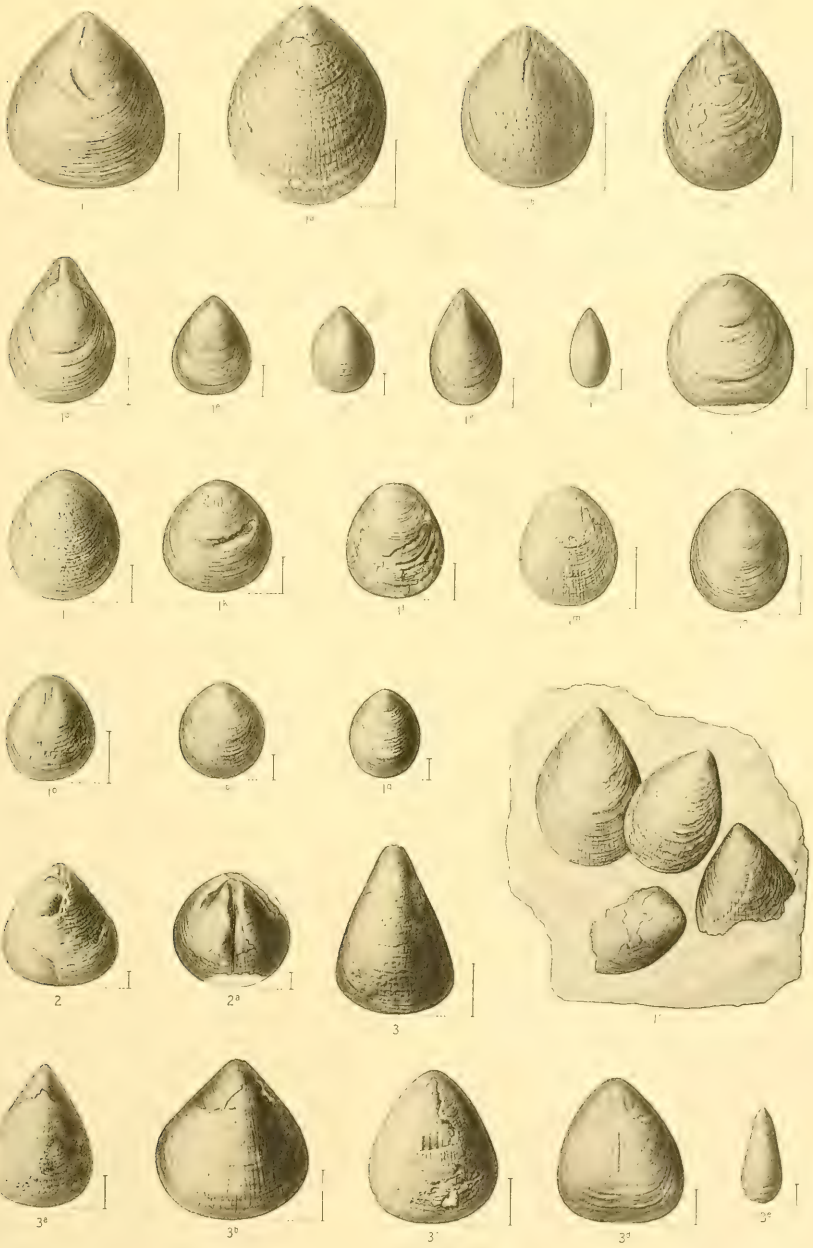
Figure 3. Ventral valve with the apex worn off, from Locality **7z**, Upper Cambrian limestone about 3 miles southeast of Emigrant Pass, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 51884a.

3a. Ventral valve intermediate in form between specimens represented by figures 3 and 3b, from Locality **7y**, Upper Cambrian limestones 2.5 miles southeast of Emigrant Pass, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 56967a.

3b. Broad form of ventral valve with apex broken off, from Locality **7x**, Upper Cambrian limestones 2.5 miles southeast of Emigrant Pass, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 56967b.

3c and 3d. Dorsal valves associated with the shell represented by figure 3. U. S. Nat. Mus. Cat. Nos. 51884b and 51884c, respectively.

3e. A small, slender ventral valve associated with the shell represented by figure 3. U. S. Nat. Mus. Cat. No. 51884d.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLATE XXXV.

PLATE XXXV.

a. Central lateral space of area.
a'. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella collicia (Matthew) (p. 486).

Figure 1. Exterior of an imperfect ventral valve, the type specimen. University of Toronto, Canada.

1a. Partly exfoliated ventral valve, showing visceral area and vascular sinuses. University of Toronto, Canada.

1b. Crushed and broken cast of the interior of a ventral valve. University of Toronto, Canada.

The specimens represented by figures 1, 1a–b are from Locality **13n'**, Middle Cambrian sandy shales of Division E3e, Dugald Brook, Cape Breton, Nova Scotia. The figures are drawn from three of the specimens illustrated by Matthew [1899b, Pl. I, figs. 3a–e], but closer identification is impossible.

Figure 1c. Exterior of a dorsal valve broadened and distorted by compression. Locality **13m**, Middle Cambrian sandstones of Division E3f, Gillis Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51772a.

1d. Imperfect cast of interior of a dorsal valve from Locality **13n'**, Middle Cambrian sandy shales of Division E3e, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52453a.

1e. Imperfect cast of interior of a flattened dorsal valve from Locality **10p**, Middle Cambrian sandy shales of Division E2b, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 35294a.

1f. Cast of the interior of a ventral valve associated with the shell represented in figure 1e. U. S. Nat. Mus. Cat. No. 35294b.

2. Cast of interior of ventral valve from Locality **13m**, Middle Cambrian sandstones of Division E3f, Gillis Brook, Cape Breton, Nova Scotia, showing area and position of vascular sinuses. U. S. Nat. Mus. Cat. No. 57084a.

2a. Exterior of a slightly distorted ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 57084b.

2b. Broad ventral valve, doubtfully referred to this species, from Locality **10p**, Middle Cambrian sandy shales of Division E2b, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 57083a.

2c. Dorsal valve associated with the specimen represented by figure 2a. U. S. Nat. Mus. Cat. No. 57084c.

2d. Interior of a dorsal valve associated with the specimen represented by figure 2a, showing a strong median ridge and the position of the central muscle scars. U. S. Nat. Mus. Cat. No. 57084d.

Figures 2, 2a–d represent forms corresponding to those referred by Matthew [1903, pp. 114–115] to *Leptobolus collicia collis*.

Lingulella cania (Walcott) (p. 484).

Figures 3 and 3b. Casts of the interior of ventral valves from Locality **3i**, Middle Cambrian sandy shale on McLean Brook, 1.5 miles west of Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 52451a and 52451c, respectively. Figure 3 represents the type specimen.

3a. Partly exfoliated ventral valve associated with the shells represented in figures 3 and 3b. U. S. Nat. Mus. Cat. No. 52451b.

3c. Exterior of dorsal valve from Locality **10s**, Middle Cambrian sandstone on McLean Brook, near Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 35295a.

3d. Cast of interior of dorsal valve associated with the specimens represented by figures 3 and 3b. U. S. Nat. Mus. Cat. No. 52451d.

Lingulella ferruginea Salter (p. 496).

[Pl. XXIX, figs. 1, 1a–w, 2, 2a–f; Pl. XXX, fig. 1; and Pl. XXXI, figs. 3, 3a–c.]

Figures 4 and 4a. Partly exfoliated ventral valves, showing cast of the area and pedicle furrow, from Locality **3h**, Middle Cambrian arenaceous shales, McNeil Brook, 1.5 miles east of Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 51758a and 51758b, respectively.

4b. Dorsal valve associated with the ventral valves represented by figures 4 and 4a. U. S. Nat. Mus. Cat. No. 51758c.

FRANCES WIESER DEL.

HELIOTYPE CO. BOS

LINGULELLA ATAVA (Matthew) (p. 479).

FIGURE 5. Exterior of ventral valve from Locality **13n′**, Middle Cambrian sandstones of Division E3e, Dugald Brook, Cape Breton, Nova Scotia. Type specimen, figured by Matthew [1899b, Pl. II, fig. 1a] as *Leptobolus atavus*.

5a and 5b. Partly exfoliated ventral valves, showing area, pedicle furrow, and outline of visceral cavity. Locality **10p**, Middle Cambrian sandstones of Division E2b, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 35293a and 35293b, respectively.

5c. Dorsal valve associated with the specimens represented by figure 5. University of Toronto, Canada. Specimen figured by Matthew [1899b, Pl. II, fig. 1d] as *Leptobolus atavus*.

5d. Cast of interior of dorsal valve, showing outline of visceral area, position of anterolateral muscle scars, vascular sinuses, and area. Locality **13n′**, Middle Cambrian sandy shales of Division E3e, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52450a.

5e. Dorsal valve. The specimen can not now be located. It was in the collections of the United States National Museum, but the locality is unknown.

5f, 5g, and 5h. Casts of laterally compressed dorsal valves associated with the ventral valves represented by figures 5a and 5b. U. S. Nat. Mus. Cat. Nos. 35293c, 35293d, and 35293e, respectively.

LINGULELLA FLUMENIS (Matthew) (p. 500).

FIGURE 6. Exterior of imperfect ventral valve. University of Toronto, Canada. Type specimen, figured by Matthew [1903, Pl. XI, fig. 7a] as *Leptobolus flumenis*.

6a. Interior of dorsal valve. University of Toronto, Canada. Specimen figured by Matthew [1903, Pl. XI, fig. 7b] as *Leptobolus flumenis*.

6b. Cast of interior of dorsal valve. University of Toronto, Canada. Specimen figured by Matthew [1903, Pl. XI, fig. 7e] as *Leptobolus flumenis*.

The specimens represented are all from Locality **325a**, Middle Cambrian shales of Division C2c on McNeil Brook, Cape Breton, Nova Scotia.

LINGULELLA TORRENTIS (Matthew) (p. 535).

FIGURE 7. Ventral valve from Locality **344f**, Middle Cambrian shales of Matthew's Coldbrook group, Dugald Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Type specimen, figured by Matthew [1903, Pl. VI, fig. 1] as *Leptobolus torrentis*.

LINGULELLA ATAVA INSULÆ (Matthew) (p. 480).

FIGURES 8 and 8a. Ventral and dorsal valves from Locality **307d**, Middle Cambrian sandy limestone of Division E2a?, at Youngs Point near George River Station, Cape Breton, Nova Scotia. University of Toronto, Canada. Specimens figured by Matthew [1903, Pl. VI, figs. 4a and 4b] as *Leptobolus atavus insulæ*. Figure 8 represents the type specimen.

LINGULELLA ORA (Walcott) (p. 522).

FIGURE 9. Exterior of a broken ventral valve, the type specimen, from Locality **9p**, Upper Cambrian limestone, 15 miles northwest of Fort Sill, Comanche County, Oklahoma. U. S. Nat. Mus. Cat. No. 51794a.

9a and 9a′. Top and side views of a partly exfoliated ventral valve which illustrates the thickness of the shell, from Locality **9q**, Upper Cambrian limestone, 15 miles northwest of Fort Sill, Comanche County, Oklahoma. U. S. Nat. Mus. Cat. No. 51795a.

9b and 9b′. Top and side views of a ventral valve associated with the shell represented in figure 9, showing the outer surface of one of the inner layers of the shell. U. S. Nat. Mus. Cat. No. 51794b.

9c and 9c′. Top and side views of an elongate dorsal valve associated with the shell represented in figure 9. U. S. Nat. Mus. Cat. No. 51794c.

9d. Short broad form of dorsal valve associated with the shell represented in figure 9. U. S. Nat. Mus. Cat. No. 51794d.

PLATE XXXVI.

PLATE XXXVI.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
g. Umbonal muscle scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
ivs. Lateral branches of vascular system.
pvs. Peripheral branches of vascular system.
x. Heart-shaped cavity.

OBOLUS SELWYNI (Matthew) (p. 413).

[Pl. XXXVII, figs. 1, 1a-f.]

FIGURE 1. Interior of a dorsal valve, showing a portion of the visceral area and adjoining parts; also the striation of one of the inner layers of the shell. University of Toronto, Canada. Redrawn (with fig. 1c) from the specimens on which Matthew [1903] based the diagrammatic figures in the left-hand figure on page 117 and figures 1a and 1c of Plate VII of his paper.

1a. Exfoliated ventral valve, showing the visceral area and adjoining portions of the interior of the shell. University of Toronto, Canada.

1b. Side outline of specimen represented by figure 1a.

1c. Interior of a ventral valve, longitudinally compressed, which emphasizes the main vascular sinuses and the lateral branches of the vascular system. University of Toronto, Canada. Redrawn (with fig. 1) from the specimens on which Matthew [1903] based the diagrammatic figures in the left-hand figure on page 117 and figures 1a and 1c of Plate VII of his paper.

1d. Interior of a dorsal valve, showing portions of the vascular system. University of Toronto, Canada.

1e, 1f, and 1g. Interior of dorsal valves, showing variation in position of the central and anterior lateral muscle scars. University of Toronto, Canada.

1h. Dorsal valve longitudinally compressed, giving it a very broad form. This may be compared with figures 1c and 1f of Plate XXXVII. University of Toronto, Canada.

2. Cast of interior of a ventral valve, broadened by compression. University of Toronto, Canada. Specimen figured by Matthew [1902c, Pl. I, fig. 4b] as *Obolus æquiputeis*.

2a. Cast of interior of a dorsal valve. University of Toronto, Canada. Specimen figured by Matthew [1902c, Pl. I, fig. 4d] as *Obolus æquiputeis*.

2b. Cast of the interior of a dorsal valve. University of Toronto, Canada.

The specimens represented are all from Locality **307d**, Middle Cambrian sandy limestone of Division E2a? on Youngs Point, near George River Station, Cape Breton, Nova Scotia.

LINGULELLA UPIS (Walcott) (p. 538).

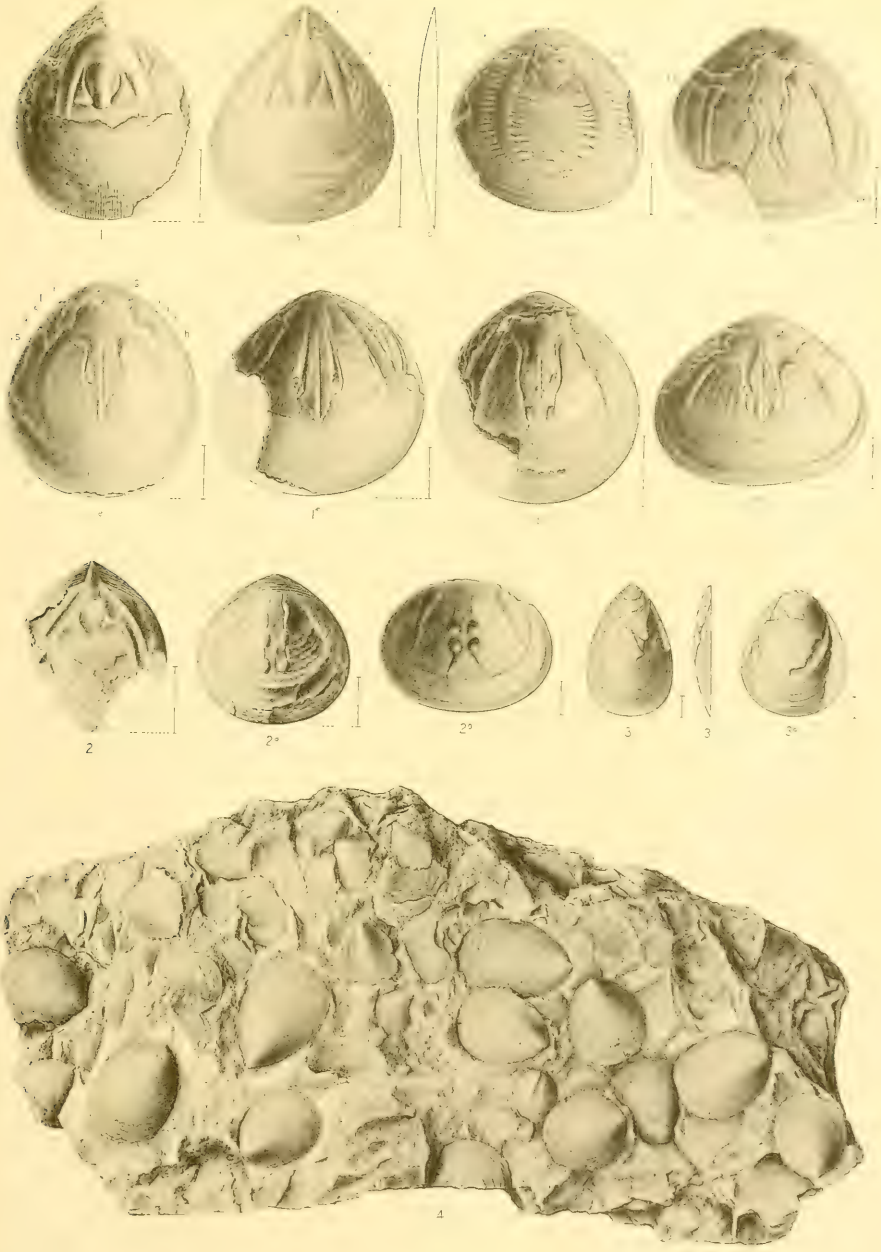
FIGURES 3 and 3′. Top and side views of partly exfoliated ventral valve, the type specimen, from Locality **14i**, Upper Cambrian limestone 1 mile west of Cherokee, San Saba County, Texas. U. S. Nat. Mus. Cat. No. 51804a.

3a. Fragmentary dorsal valve associated with the ventral valve represented by figure 3. U. S. Nat. Mus. Cat. No. 51804b.

LINGULELLA BELLA (Walcott) (p. 481).

[Pl. XIX, figs. 2, 2a-q.]

FIGURE 4. Slab of arenaceous shale with numerous well-preserved shells from Locality **114b**, Lower Ordovician sandstone 1 mile north of Lance Cove, Great Belle Island, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 27308n.



FRANCES WIESER DEL.

HELIOTYPIC CO. BOSTON

PLATE XXXVII.

PLATE XXXVII.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
g. Umbonal muscle scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
ps. Parietal band.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
ivs. Lateral branches of the vascular system.
x. Heart-shaped cavity.

OBOLUS SELWYNI (Matthew) (p. 413).

[Pl. XXXVI, figs. 1, 1a–h, 2, 2a–b.]

FIGURE 1. Exterior of a distorted ventral valve. University of Toronto, Canada. Possibly one of the specimens used by Matthew in preparing the diagrammatic figures mentioned under figure 1c.

1a. Cast of an interior of a ventral valve. University of Toronto, Canada.

1b. Cast of an interior of a ventral valve that has been compressed laterally. University of Toronto, Canada. Possibly one of the specimens used by Matthew in preparing the diagrammatic figures mentioned under figure 1c.

1c. Cast of an interior of a dorsal valve. University of Toronto, Canada. Redrawn from the specimen upon which Matthew [1903] based the diagrammatic figures in the right-hand figure on page 117 and in figure 1b of Plate VII of his paper. It may be taken as the type.

1d. Finely preserved interior of a ventral valve. University of Toronto, Canada. Possibly one of the specimens used by Matthew in preparing th e diagrammatic figures mentioned under figure 1c.

1e. Interior of the posterior portion of a dorsal valve. University of Toronto, Canada.

1f. Cast of an interior of a dorsal valve. University of Toronto, Canada. Possibly one of the specimens used by Matthew in preparing the diagrammatic figures mentioned under figure 1c.

The specimens represented are all from Locality **307d**, Middle Cambrian sandy limestone of Division E2a? on Youngs Point, near George River Station, Cape Breton, Nova Scotia.

LINGULELLA (LINGULEPIS) STARRI (Matthew) (p. 559).

FIGURE 2. Poorly preserved ventral valve. University of Toronto, Canada.

2a. Dorsal valve preserving a portion of the shell. University of Toronto, Canada.

2b. Cast of a portion of the interior of a ventral valve. University of Toronto, Canada.

The specimens represented are all from Locality **308c**, Upper Cambrian shales of Matthew's Johannian at St. John, New Brunswick. According to Matthew the type specimens have been either mislaid or lost. All the figures are drawn from new material collected by him at the type locality.

LINGULELLA MINOR (Matthew) (p. 519).

FIGURE 3. Cast of the exterior of a ventral valve slightly compressed and distorted in the shale. University of Toronto, Canada. Type specimen, figured by Matthew [1892, Pl. XII, fig. 5a] as *Lingulella starri minor*.

3a. Dorsal valve from which nearly all of the shell is exfoliated. University of Toronto, Canada. Specimen figured by Matthew [1892, Pl. XII, fig. 5b] as *Lingulella starri minor*.

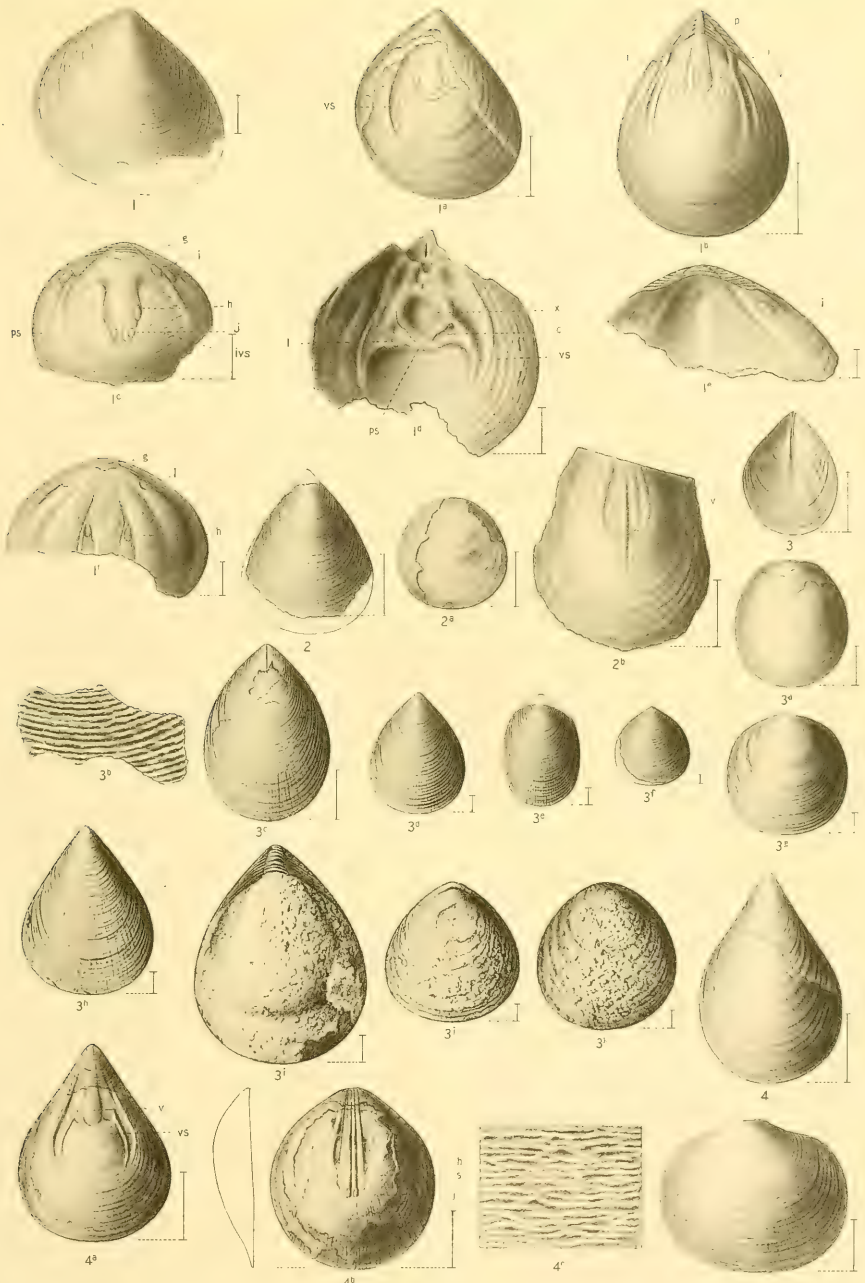
3b. Enlargement of the outer surface of the shell. University of Toronto, Canada.

3c. Ventral valve from siliceous shale. U. S. Nat. Mus. Cat. No. 51765a.

3d and 3e. Small ventral and dorsal valves from a fine arenaceous shale. U. S. Nat. Mus. Cat. Nos. 51765b and 51765c, respectively.

3f and 3g. Small broad form of ventral and dorsal valves associated with narrower forms represented by figures 3d and 3c. U. S. Nat. Mus. Cat. Nos. 51765d and 51765e, respectively.

The specimens are all from Locality **2x**, Upper Cambrian sandstones on Long Island, Kennebecasis Bay, St. John County, New Brunswick.



FRANCES WIESER DEL

HELIOTYPE CO BOSTON

Lingulella rotunda (Matthew) (p. 530).

Figure 3h. Exterior of a small ventral valve. U. S. Nat. Mus. Cat. No. 51770a.
3i. Cast of interior of ventral valve. U. S. Nat. Mus. Cat. No. 51770b.
3j and 3k. Casts of interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 51770c and 51770d.

The specimens represented are all from Locality **3i**, Middle Cambrian sandy shale on McLean Brook, 1.5 miles west of Marion Bridge, Cape Breton, Nova Scotia.

Lingulella (Lingulepis) roberti (Matthew) (p. 557).

Figure 4. Ventral valve preserving a portion of the outer surface. University of Toronto, Canada.
4a. Cast of the interior of a ventral valve, the type specimen. University of Toronto, Canada. (See note following 4d.)
4b. Cast of the interior of a dorsal valve, preserving outline and convexity of valve and impressions of muscle scars. University of Toronto, Canada. (See note following 4d.)
4c. Enlargement of a portion of the outer surface of the anterior portion of a dorsal valve. University of Toronto, Canada.
4d. Dorsal valve distorted by compression. University of Toronto, Canada.

The figures are all drawn from specimens in Matthew's type material. It is possible that the specimens represented by figures 4a and 4b are the ones figured by Matthew [1895b, Pl. I, figs. 2a and 2b, respectively], but closer identification is impossible. The specimens represented are all from Locality **307d**, Middle Cambrian sandy limestone of Division E2a? at Youngs Point, near George River Station, Cape Breton, Nova Scotia.

PLATE XXXVIII.

PLATE XXXVIII.

a. Central lateral space of area.
a'. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
j. Transmedian muscle scar.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
ivs. Lateral branches of the vascular system.
pvs. Peripheral branches of the vascular system.
x. Heart-shaped cavity.

Lingulella martinensis Matthew (p. 518).

Figure 1. Exterior of an unusually well-preserved ventral valve. University of Toronto, Canada. Drawn from a specimen in Matthew's type and figured material, but closer identification is impossible.

1a. Cast of the interior of a ventral valve. University of Toronto, Canada. Type specimen figured by Matthew [1895a, Pl. II, fig. 6d].

1b. Interior of a ventral valve from which nearly all of the inner layers of the shell have been exfoliated. University of Toronto, Canada. Drawn from a specimen in Matthew's type and figured material, but closer identification is impossible.

1c. Interior of a dorsal valve. University of Toronto, Canada. Drawn from a specimen in Matthew's type and figured material, but closer identification is impossible.

1d. Cast of the interior of a dorsal valve. University of Toronto, Canada. Specimen figured by Matthew [1895a, Pl. II, fig. 6b].

1e. Enlargement of the area of the specimen represented by figure 1d.

The specimens represented by figures 1, 1a–e are from Locality **2f**, Middle Cambrian sandstones of Division 1b1, on Hanford Brook, St. John County, New Brunswick.

Figures 1f and 1g. Ventral and dorsal valves which occur in the collection of the University of Toronto, Canada, labeled by Matthew as *Lingulella dawsoni* from Division 1c of the St. John slate. They appear to be more nearly related to *Lingulella martinensis*. They may or may not be the specimens illustrated by Matthew [1886, Pl. V, figs. 9, 9a–c].

Lingulella grandis (Matthew) (p. 502).

Figure 2. Partly exfoliated dorsal valve. University of Toronto, Canada.

2a. Cast of the interior of the posterior portion of a ventral valve. University of Toronto, Canada.

Figures 2 and 2a (with 2c and 2d) are drawn from specimens in Matthew's type material of *Lingulella? cuneata*, but it is impossible to tell which of these he figured [1894, Pl. XVI, figs. 5a–b].

Figure 2b. Slightly imperfect cast showing the greater part of the interior of a ventral valve. University of Toronto, Canada. Type specimen, figured by Matthew [1894, Pl. XVI, fig. 7a] as *Leptobolus grandis*.

2c. Cast of the interior of a ventral valve. University of Toronto, Canada.

2d. Cast of the interior of a dorsal valve. University of Toronto, Canada.

Figures 2c and 2d (with 2 and 2a) are drawn from specimens in Matthew's type material of *Lingulella? cuneata*, but it is impossible to tell which of these he figured [1894, Pl. XVI, figs. 5a–b].

Figure 2e. Posterior portion of a dorsal valve, showing cast of the area. University of Toronto, Canada. Labeled by Matthew as *Leptobolus grandis*.

2f. Part of the interior of a dorsal valve. University of Toronto, Canada. Specimen figured by Matthew [1894, Pl. XVI, fig. 7b] as *Leptobolus grandis*.

The specimens represented by figures 2, 2a–f are all from Locality **30ls**, Lower Ordovician sandstone at McAphee's Corner, Hardingville, St. John County, New Brunswick.

Obolus belli (Billings) (p. 386).

Figures 3 and 3a. Ventral valves from Locality **319n**, Ordovician, on the island of Montreal, Canada. Geol. Survey Canada. Redrawn from the specimens figured by Billings [1859, pp. 431–432, figs. 7 and 8], but closer identification is impossible. Figure 3 may be taken as the type.

3b. Dorsal valve associated with the specimens represented by figures 3 and 3a. Geol. Survey Canada.

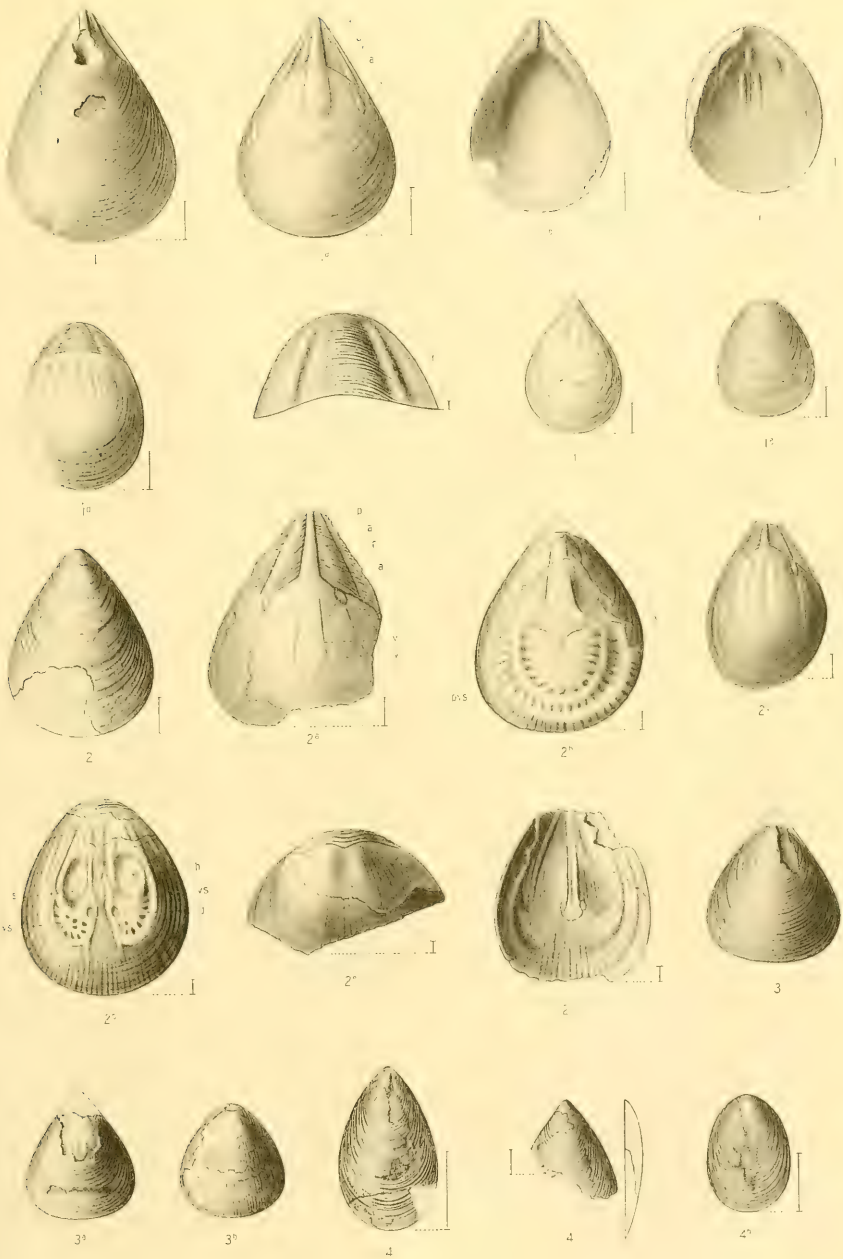
Lingulella welleri (Walcott) (p. 539).

Figure 4. Compressed and somewhat crushed ventral valve, the type specimen, showing only the general outline and the outer surface. U. S. Nat. Mus. Cat. No. 35292a.

4a. Apex and posterior portion of the ventral valve, preserving the convexity. U. S. Nat. Mus. Cat. No. 35292b.

4b. A compressed dorsal valve. U. S. Nat. Mus. Cat. No. 35292c.

The specimens represented are all from Locality **11c**, Upper Cambrian sandstone, O'Donnell and McManniman's quarry, Newton, New Jersey.



FRANCES WIESER DEL.

PLATE XXXIX.

PLATE XXXIX.

a. Central lateral space of area.
a′. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral and middle lateral muscle scars on dorsal valve.
p. Pedicle groove.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella wanniecki Redlich (p. 538).

Figure 1. Elongate form of the ventral valve. U. S. Nat. Mus. Cat. No. 51744o.
1a, 1b, and 1c. Short, broad, subtriangular forms of the ventral valve. U. S. Nat. Mus. Cat. Nos. 51744a, 51744b, and 51744c, respectively.
1d. Cast of the interior of a ventral valve, showing the area, visceral area, and vascular sinuses. U. S. Nat. Mus. Cat. No. 51744d.
1e. Imperfect interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51744e.
1f. Dorsal valve in position against the ventral valve, showing the area of the ventral valve. U. S. Nat. Mus. Cat. No. 51744f.
1g, 1h, and 1i. Exteriors of dorsal valves, varying somewhat in outline. U. S. Nat. Mus. Cat. Nos. 51744g, 51744h, and 51744i, respectively.
1j and 1k. Interiors of imperfect dorsal valves. U. S. Nat. Mus. Cat. Nos. 51744j and 51744k, respectively.
1 l. Interior of a remarkably well preserved dorsal valve. U. S. Nat. Mus. Cat. No. 51744 l.
1m. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51744m.
1n. Interior of a dorsal valve, showing anterior lateral scars and narrow ridges in the position of the main vascular sinuses. U. S. Nat. Mus. Cat. No. 51744n.

The specimens represented are all from Locality **15r**, Middle Cambrian argillaceous shale at Khussak, Salt Range, India.

Lingulella fuchsi Redlich (p. 502).

Figure 2. Narrow elongate form which may be compared with figure 3. U. S. Nat. Mus. Cat. No. 51746a.
2a. Cast of a very small dorsal valve. U. S. Nat. Mus. Cat. No. 51746b.
2b and 2c. Dorsal valves referred to this species. U. S. Nat. Mus. Cat. Nos. 51746c and 51746d, respectively.
3. Ventral valve, the type specimen. Copied from Redlich [1899, Pl. I, fig. 10c].

The specimens represented are all from Locality **15r**, Middle Cambrian argillaceous shale at Khussak, Salt Range, India.

Lingulella isse (Walcott) (p. 509).

[Text figs. 43A–F, p. 510.]

Figures 4 and 4a. Narrow and broad forms of ventral valves, with exterior shell partly exfoliated. U. S. Nat. Mus. Cat. Nos. 51808a and 51808b, respectively. Figure 4a represents the type specimen.
4a′. Side outline of specimen represented by figure 4a.
4b and 4b′. Exfoliated dorsal valve and side outline. U. S. Nat. Mus. Cat. No. 51808c.

The specimens represented are all from Locality **15d**, Upper Cambrian limestone near Cave Spring, Fish Spring Range, Utah.

Obolus mcconnelli pelias (Walcott) (p. 398).

[Pl. XXIII, figs. 3b–c.]

Figure 5. Ventral valve with outer layer of shell exfoliated, from Locality **15p**, Middle Cambrian limestones near the north end of the Fish Spring Range, Utah. U. S. Nat. Mus. Cat. No. 51597a.
5a and 5b. Partly exfoliated dorsal valves associated with the specimen represented by figure 5. U. S. Nat. Mus. Cat. Nos. 51597b and 51597c, respectively.
5c. A dorsal valve doubtfully referred to this species, from Locality **7s**, Upper Cambrian shale 4 miles south-southeast of Emigrant Peak, Silver Peak quadrangle, Nevada. U. S. Nat. Mus. Cat. No. 51593a.

FRANCES WIESER DEL.

Lingulella quadrilateralis (Walcott) (p. 528).

Figure 6. Ventral valve with outer layer of shell exfoliated, the type specimen, from Locality **91**, Middle Cambrian shales at Cedar Bluff, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 51777a.

6a. Dorsal valve and side outline of united valves, associated with the specimen represented by figure 6. U. S. Nat. Mus. Cat. No. 51777b.

Obolus chinensis (Walcott) (p. 387).

Figure 7. Partly exfoliated ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52532a.

7a. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52532b. Another specimen (Cat. No. 52532c) was used to restore certain parts of this drawing.

7b. Exfoliated dorsal valve, showing visceral area. U. S. Nat. Mus. Cat. No. 52532d.

The specimens represented are all from Locality **C62**, Middle Cambrian limestones 2.5 miles south of Yenchuang, Sintai district, Shantung, China.

Lingulella damesi (Walcott) (p. 489).[a]

Figure 8. Top and side view of a partly exfoliated ventral valve, showing outline of posterior portion of visceral area and position of the main vascular sinuses. U. S. Nat. Mus. Cat. No. 52529a.

8a. Partly exfoliated ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52529b.

8b. Exterior of a ventral? valve. U. S. Nat. Mus. Cat. No. 52529c.

8c. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52529d.

The specimens represented are all from Locality **C10**, Middle Cambrian limestone about 3 miles southwest of Yenchuang, Sintai district, Shantung, China.

Lingulella (Lingulepis) eros (Walcott) (p. 551).

Figures 9 and 9a. Ventral and dorsal valves restored in outline from other specimens. Locality **C7**, Middle Cambrian limestone 2.2 miles southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. Nos. 52527a and 52527b, respectively. Figure 9 represents the type specimen.

Obolus (Westonia) blackwelderi Walcott (p. 453).

Figure 10. An elongate ventral valve, the type specimen, with posterior portion broken away, from Locality **C6**, Middle Cambrian shaly limestone 2.5 miles southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52540a.

10a. Short form of ventral valve associated with the shell represented by figure 10. U. S. Nat. Mus. Cat. No. 52540b.

10b. Exterior of a dorsal valve from Locality **C2**, Middle Cambrian limestone 2 miles south of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52541a.

10c. Enlargement of surface of a shell associated with the ventral valve represented by figure 10. U. S. Nat. Mus. Cat. No. 52540c.

Lingulella heberti Barrois (p. 505).

11. Exterior of ventral valve.

11a. Exterior of dorsal valve.

11b. Cast of interior of ventral valve, the type specimen.

11c. Enlargement of the outer surface.

Figures 11, 11a–c are copied from Barrois [1882, Pl. IV, figs. 3a–d, respectively]. The specimens represented are all from Locality **350a**, Ordovician sandstone at Cape Vidio, Province of Oviedo, Spain.

---

[a] Now referred to *Obolus*; see p. 489.

PLATE XL.

PLATE XL.

v. Visceral cavity.

Lingulella (Lingulepis) acuminata (Conrad) (p. 545).

[Pl. XXXIV, figs. 3, 3a–e; Pl. XLI, figs. 1, 1a–n; and Pl. XLII, figs. 1, 1a–o.]

Figure 1. Ventral valves, the type specimens, from Locality **338s**, Upper Cambrian sandstone at High Bridge on Ausable River, Essex County, New York. Copied from Hall [1847, text fig., p. 9], who states that the figure is copied from a drawing made by Conrad.

1a. Ventral valves from Locality **338s**, Upper Cambrian sandstone at High Bridge on Ausable River, Essex County, New York. Copied from Emmons's figure [1842, text fig. 68, p. 268] of *Lingula antiqua*.

1b. Partly exfoliated ventral valve, showing the visceral cavity, from Locality **110**, Upper Cambrian sandstone, east side of the town of Whitehall, New York. U. S. Nat. Mus. Cat. No. 51877a.

1c. Narrow ventral valve associated on the same slab of rock with figure 1b. U. S. Nat. Mus. Cat. No. 51877b.

1d and 1e. Dorsal valves associated with the ventral valves represented by figures 1b and 1c. U. S. Nat. Mus. Cat. Nos. 51877c and 51877d, respectively.

1f and 1g. Small ventral and dorsal valves, from Locality **109**, Upper Cambrian sandstone 1.5 miles south of Deweys Bridge on the Champlain Canal, Washington County, New York. U. S. Nat. Mus. Cat. Nos. 51879a and 51879b, respectively.

1h. Ventral valve from Locality **76a**, Upper Cambrian arenaceous limestone 1 mile north of Saratoga Springs, New York. U. S. Nat. Mus. Cat. No. 52469a.

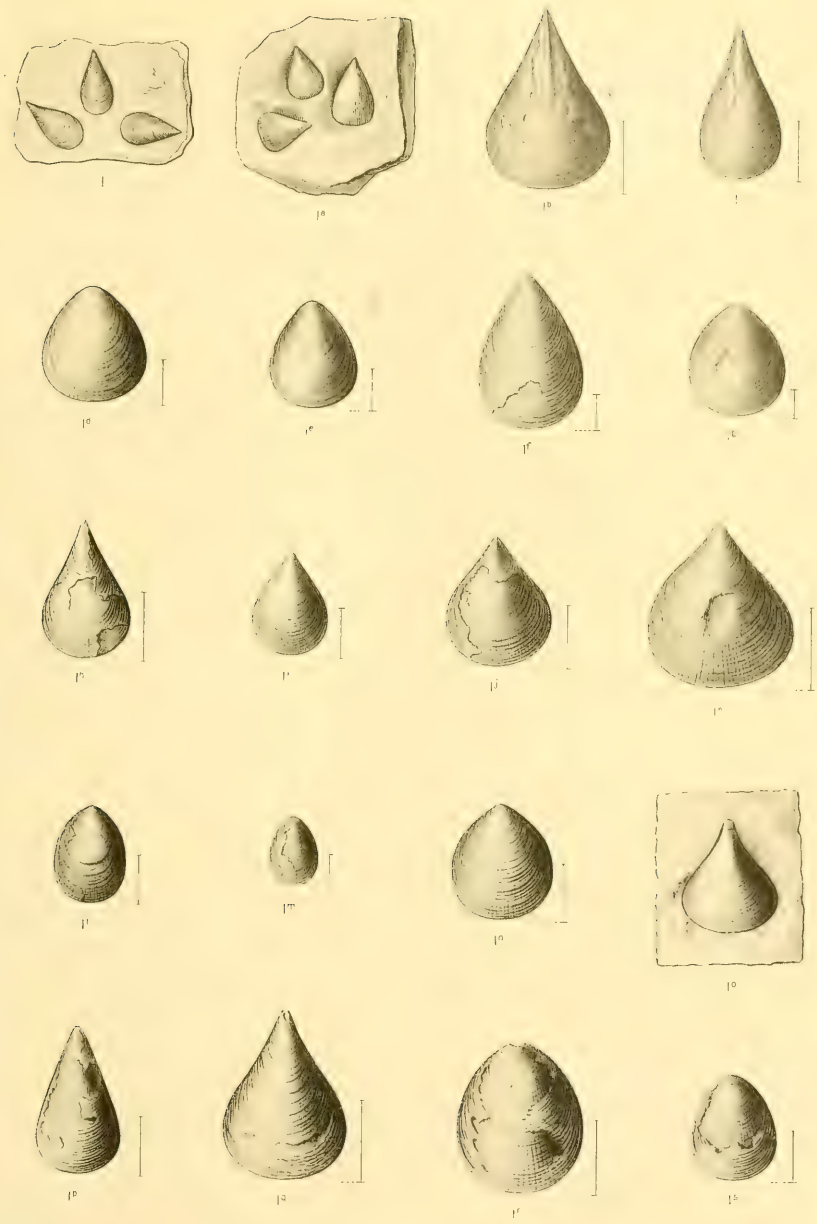
1i, 1j, and 1k. Ventral valves, from Locality **76**, Upper Cambrian impure limestones 4 miles west of Saratoga Springs, New York. U. S. Nat. Mus. Cat. Nos. 51878a, 51878b, and 51878c, respectively.

1 l, 1m, and 1n. Dorsal valves associated with the specimens represented by figures 1i, 1j, and 1k. U. S. Nat. Mus. Cat. Nos. 51878d, 51878e, and 51878f, respectively.

1o. A broad ventral valve, from Locality **392**, Upper Cambrian Potsdam sandstone, Burgess, Canada. U. S. Nat. Mus. Cat. No. 17999a.

1p and 1q. Narrow and broad form of the ventral valve, from Locality **105**, Upper Cambrian limestone at Bishops Mill, Hancock County, Tennessee. U. S. Nat. Mus. Cat. Nos. 51881a and 51881b, respectively.

1r and 1s. Dorsal valves associated with the ventral valves represented by figures 1p and 1q. U. S. Nat. Mus. Cat. Nos. 51881c and 51881d, respectively.



FRANCES WIESER DEL.

PLATE XLI.

PLATE XLI.

á'. Outer lateral space of area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
v. Visceral cavity.
vs. Main vascular sinus.

LINGULELLA (LINGULEPIS) ACUMINATA (Conrad) (p. 545).

[Pl. XXXIV, figs. 3, 3a–e; Pl. XL, figs. 1, 1a–s; and Pl. XLII, figs. 1, 1a–o.]

FIGURE 1. Slab figured by Owen [1852, Pl. IB, fig. 8] as *Lingula pinnaformis*. U. S. Nat. Mus. Cat. No. 17860a. Locality **328h**, Upper Cambrian sandstone at the falls of the St. Croix, Polk County, Wisconsin.

1a, 1b, and 1c. Partly exfoliated ventral valves, showing more or less of the area and interior vascular markings. These occur in Locality **82s**, Upper Cambrian sandstone at St. Croix Falls, Wisconsin. U. S. Nat. Mus. Cat. Nos. 51888a, 51888b, and 51888c, respectively.

1d and 1e. Ventral valves associated with the shells represented by figs. 1a–c. U. S. Nat. Mus. Cat. Nos. 51888d and 51888e, respectively.

1f. Dorsal valve associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 51888f.

1g. Dorsal valve associated with the specimen represented by figure 1a, showing the area and the central muscle scars. U. S. Nat. Mus. Cat. No. 51888g.

1h. Exfoliated dorsal valve associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 51888h.

1i. Ventral valve, from Locality **79b**, Upper Cambrian sandstone near Hudson, St. Croix County, Wisconsin. U. S. Nat. Mus. Cat. No. 51889a.

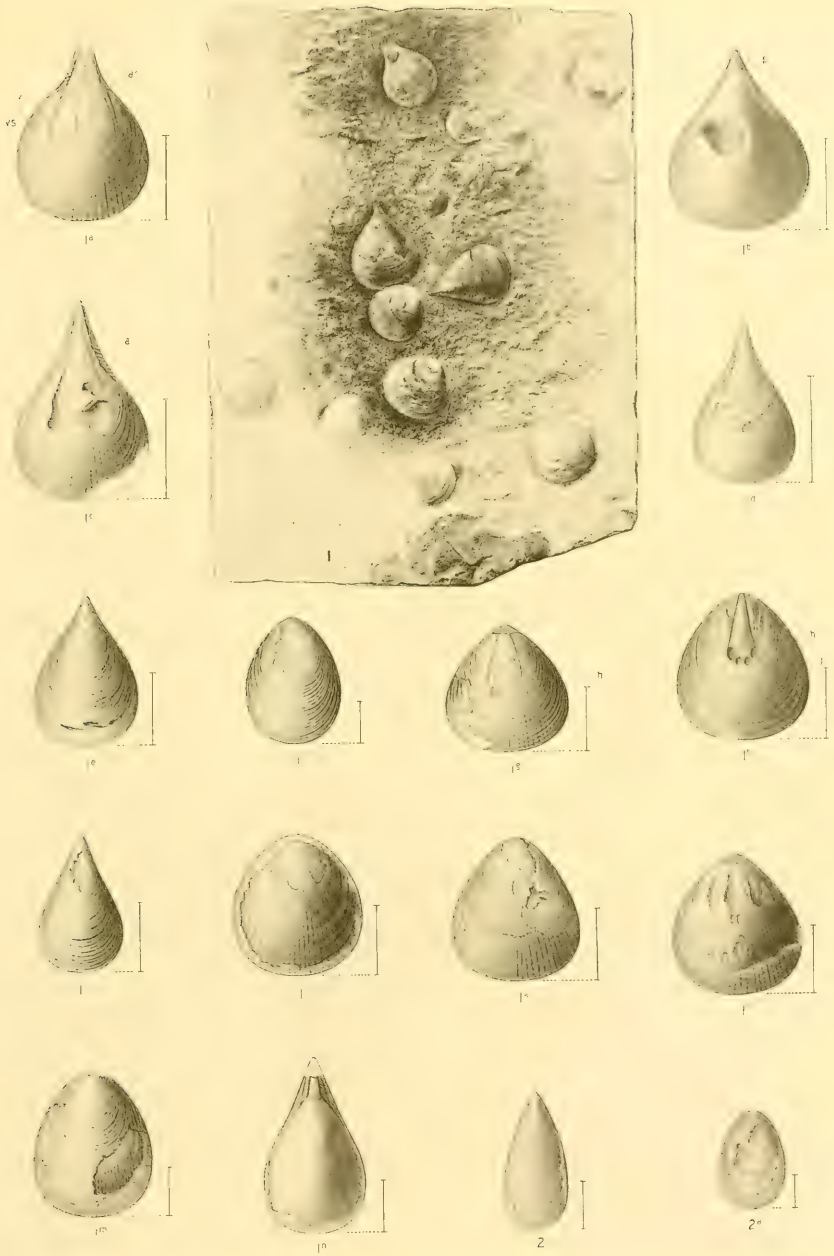
1j, 1k, and 1 l. Exfoliated dorsal valves associated with the ventral valve represented by figure 1a. U. S. Nat. Mus. Cat. Nos. 51888i, 51888j, and 51888k, respectively.

1m. Dorsal valve associated with the specimen represented by figure 1i. U. S. Nat. Mus. Cat. No. 51889b.

1n. Small exfoliated ventral valve, from Locality **84**, Middle Cambrian sandstone at Dresbach, Winona County, Minnesota. U. S. Nat. Mus. Cat. No. 51885a.

LINGULELLA (LINGULEPIS) ACUMINATA MEEKI (Walcott) (p. 550).

FIGURES 2 and 2a. Ventral and dorsal valves from Locality **302b**, Middle Cambrian limstone near Crowfoot Ridge Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. Nos. 35206a and 35206b, respectively. Figure 2 represents the type specimen.



FRANCES WIESER DEL.

HELIOTYPE CO., BOSTON.

PLATE XLII.

PLATE XLII.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
g. Umbonal muscle scar.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
v. Visceral cavity.
vs. Main vascular sinus.

Lingulella (Lingulepis) acuminata (Conrad) (p. 545).

[Pl. XXXIV, figs. 3, 3a–e; Pl. XL, figs. 1, 1a–s; and Pl. XLI, figs. 1, 1a–n.]

Figures 1 and 1d. Narrow, exfoliated ventral valve showing the visceral area. The side view, figure 1d, shows the outline of the area and the cast of the pedicle groove. Locality **355**, Middle Cambrian sandstones on Red Canyon Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 51894a.

1a and 1b. Broad ventral and dorsal valves, identified by Whitfield as *Lingulepis pinnaformis*. Locality **355**, Middle Cambrian sandstones on Red Canyon Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. Nos. 24588a and 24588b, respectively.

1c. Dorsal valve retaining a considerable amount of the laminated portion of the shell. From Locality **355d**, Upper Cambrian friable reddish sandstone, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 51898a.

1e. Cast of the interior of a ventral valve associated with the shell represented by fig. 1c, showing area, pedicle groove, and vascular markings. U. S. Nat. Mus. Cat. No. 51898b. Another specimen (Cat. No. 51898c) was used to aid in restoring this figure.

1f. Cast of the interior of a broad dorsal valve, from the friable purple sandstones of Locality **355b**, Middle Cambrian, on Castle Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 1026b.

1g and 1h. Casts of the interior of broad ventral and dorsal valves. From Locality **355d**, Upper Cambrian sandstone, Black Hills, South Dakota. U. S. Nat. Mus. Cat. Nos. 51898d and 51898e, respectively.

1i and 1j. Young shells that occur in abundance in the same layers with the specimens represented by figures 1g and 1h. U. S. Nat. Mus. Cat. Nos. 51899a and 51899b, respectively.

1k, 1l, and 1m. Ventral valves from Locality **70**, Upper Cambrian limestones on Morgans Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. Nos. 51891a, 51891d, and 51891b, respectively.

1n. Dorsal valve associated with the ventral valves represented by figures 1k, 1l, and 1m. U. S. Nat. Mus. Cat. No. 51891c.

1o. Cast of interior of dorsal valve, showing position of central and lateral muscle scars. From Locality **14b**, Upper Cambrian limestone on Cold Creek, Llano County, Texas. U. S. Nat. Mus. Cat. No. 51892a.

Obolus (Westonia) rogersi (Walcott) (p. 463).

Figure 2. Partly exfoliated ventral valve, the type specimen, illustrating the different layers forming the shell. U. S. Nat. Mus. Cat. No. 27336a.

2a. Cast of the interior of a ventral valve, showing the area and vascular markings. U. S. Nat. Mus. Cat. No. 27336b.

2b. Cast of the interior of a ventral valve in which the area extends far down the cardinal slopes. U. S. Nat. Mus. Cat. No. 27336c.

2c. Cast of the interior of a dorsal valve, showing the central position of the central muscle scars. U. S. Nat. Mus. Cat. No. 27336d.

2d. Partly exfoliated dorsal valve on which a portion of the surface of the outer shell is preserved. U. S. Nat. Mus. Cat. No. 27336e.

The specimens represented are all from Locality **343**, Lower Ordovician limestone pebbles on the beach near Newport, Rhode Island.

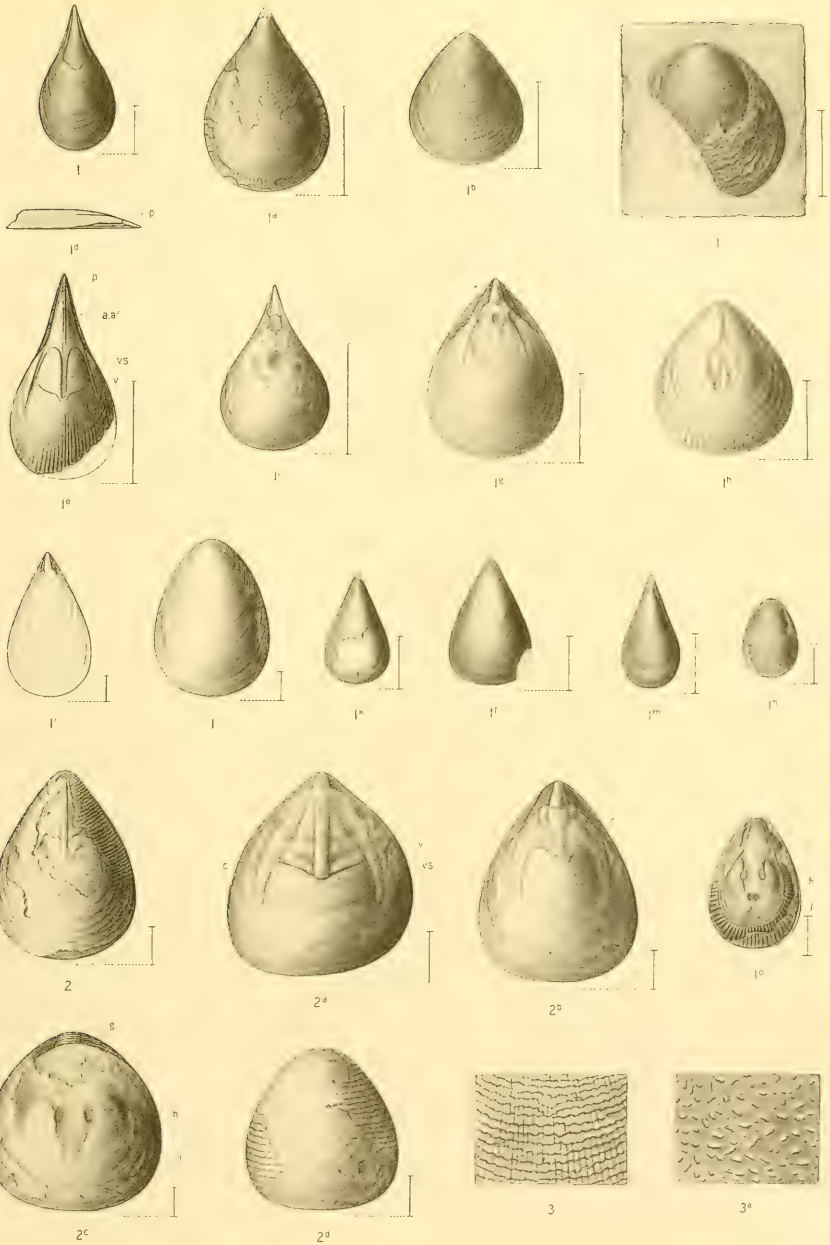
Obolus (Lingulobolus) spissus (Billings) (p. 432).

[Pl. XVI, figs. 2, 2a–k.]

Figure 3. Enlargement of the surface of the specimen represented by Plate XVI, figure 2b, of this monograph. U. S. Nat. Mus. Cat. No. 51678b.

3a. Enlargement of the outer surface of the inner layer in front of the umbonal muscle scar, of the dorsal valve represented by Plate XVI, figure 2, of this monograph. U. S. Nat. Mus. Cat. No. 51678 l.

The specimens represented are both from Locality **114b**, Upper Cambrian sandstone, 1 mile north of Lance Cove, Great Belle Island, Conception Bay, Newfoundland.



FRANCES WIESER DEL.

HELIOTYPE CO., BOSTON.

PLATE XLIII.

PLATE XLIII.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Lingulella (Lingulepis) exigua (Matthew) (p. 551).

[Pl. XXXIII, figs. 4 and 4a.]

Figure 1. Narrow acuminate ventral valve from Locality **10t**, Middle Cambrian sandstone on McLean Brook, near Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 34766a.

1a. Slightly broader form of ventral valve than that represented by figure 1, but associated with it. U. S. Nat. Mus. Cat. No. 34766b.

1b. Broader form of ventral valve than that represented by figure 1a, but associated with it. Specimens showing gradations of form between figures 1a and 1b occur in the collections. U. S. Nat. Mus. Cat. No. 34766c.

1c. Still broader form of ventral valve intermediate between specimens represented by figures 1b and 1f. Associated with the specimens represented by figures 1, 1a–b. U. S. Nat. Mus. Cat. No. 34766e.

1d. Small ventral valve with slightly rounded instead of straight or incurved cardinal slopes, from Locality **3i**, Middle Cambrian sandstone on McLean Brook, 1.5 miles west of Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 34761a.

1e. Small narrow ventral valve laterally compressed, associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 34761b.

1f. Large, partly exfoliated ventral valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 34761c.

1g. Elongate and attenuate ventral valve, showing cast of the interior surface, also a portion of the outer surface. It is associated with the shell represented in figure 1d. U. S. Nat. Mus. Cat. No. 34761d.

1h. Small ventral valve with outer shell on posterior portion. It is associated with the shell represented in figure 1d. U. S. Nat. Mus. Cat. No. 34761e.

1i. Small, partly exfoliated ventral valve compressed and flattened in the arenaceous shale. It is associated with the shell represented in figure 1d. U. S. Nat. Mus. Cat. No. 34761f.

1j. Cast of interior of a broad form of ventral valve somewhat like specimen represented by figure 1c in outline. It is associated with the specimens represented by figures 1, 1a–c. U. S. Nat. Mus. Cat. No. 34766d.

1k. Small dorsal valve with strong median sinus. It is associated with the shell represented in figure 1d. U. S. Nat. Mus. Cat. No. 34761g.

1l. Cast of the interior of a dorsal valve that has a few pustules on it. It is associated with the shell represented in figure 1d. U. S. Nat. Mus. Cat. No. 34761h.

1m. Cast of part of the interior of a well-preserved dorsal valve. It is associated with the shell represented in figure 1d. U. S. Nat. Mus. Cat. No. 34761i.

1n. Fragment of arenaceous shale from Locality **10t** (see fig. 1, above), with a group of small shells upon it. Natural size. U. S. Nat. Mus. Cat. No. 34766f.

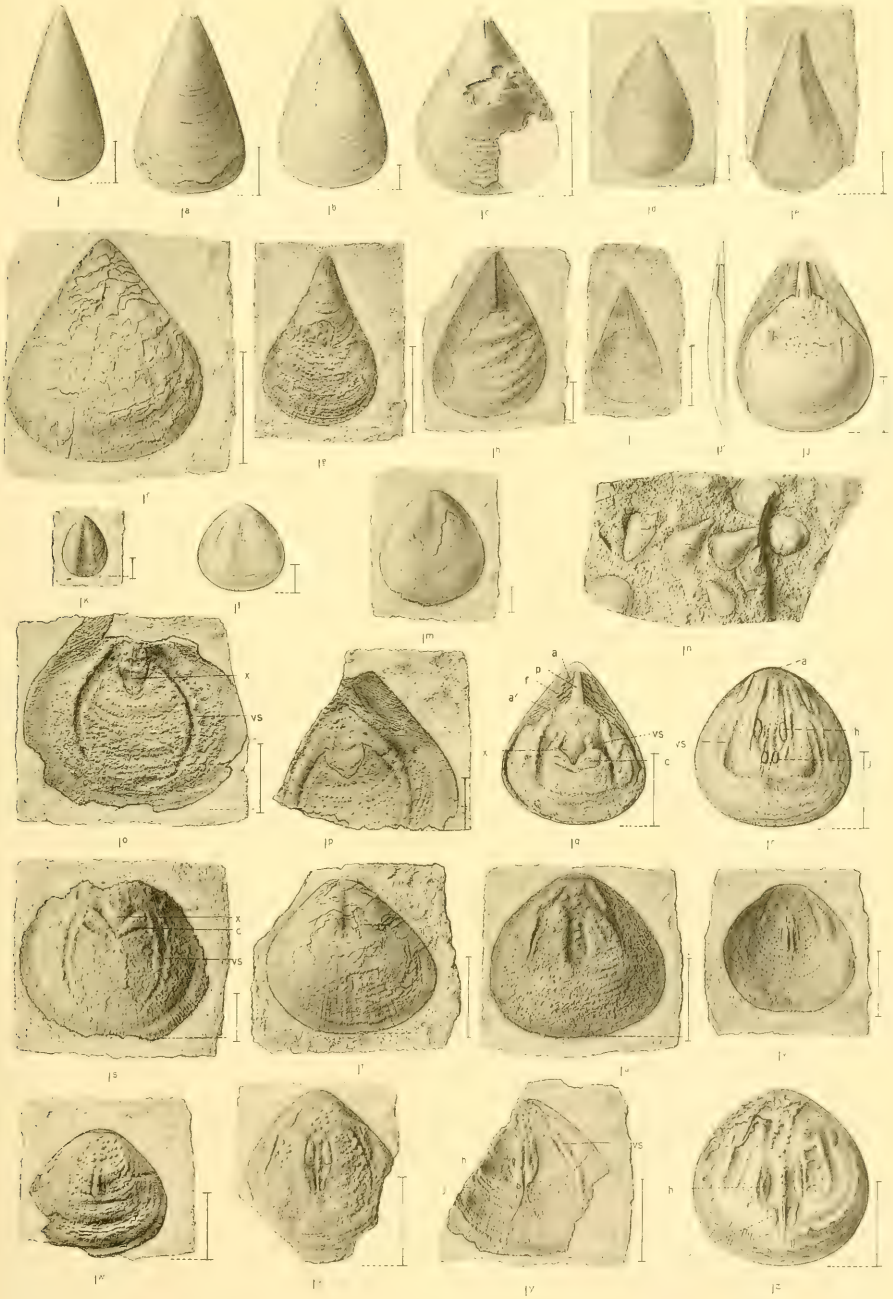
1o. Cast of the interior of ventral valve, showing cast of pits and the strong ridges of the main vascular canals, from Locality **3i**, Middle Cambrian sandstone on McLean Brook, 1.5 miles west of Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 34761j.

1p. Part of the interior of a ventral valve associated with the specimen represented by figure 1o, showing the strong ridges beneath the main vascular sinuses. U. S. Nat. Mus. Cat. No. 34761k.

1q. Cast of interior of a ventral valve, showing heart-shaped area (x), trapezoidal area (c), and cast of vascular canal ridges (vs). Locality **10s**, Middle Cambrian sandstone on McLean Brook, near Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52468b.

1r. Cast of interior of a dorsal valve associated with the specimen represented by figure 1q, showing area, visceral cavity, and portion of vascular canal ridges. U. S. Nat. Mus. Cat. No. 52468c. Another specimen (Cat. No. 34761r, from Locality **3i**) was used to restore certain portions of this figure.

1s. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1o, showing strongly marked visceral and vascular ridges. U. S. Nat. Mus. Cat. No. 34761 l.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

LINGULELLA (LINGULEPIS) EXIGUA (Matthew)—Continued.

FIGURE 1t. Large, partly exfoliated dorsal valve, of the same type as the ventral valve represented by figure 1. Associated with the specimen represented by figure 1q. U. S. Nat. Mus. Cat. No. 52468d.

1u, 1w, and 1x. Casts of the interior of dorsal valves showing variation in outline, form of visceral cavity, pitting of inner surface of valve, etc. Associated with the specimen represented by figure 1q. U. S. Nat. Mus. Cat. Nos. 34761m, 34761o, and 34761p, respectively.

1v. Interior of a dorsal valve associated with the specimen represented by figure 1q, in which the pits are arranged like beads along the lines of growth. U. S. Nat. Mus. Cat. No. 34761n.

1y. Part of interior of dorsal valve associated with the specimen represented by figure 1q, showing ridges on which the central muscle scars occur, main vascular canal ridges, and fine pitting of surface. U. S. Nat. Mus. Cat. No. 34761q.

1z. Cast of interior of dorsal valve in which the visceral area extends well toward the front. Locality 11z, Middle Cambrian sandstone on Big Ridge, 2 miles south of Marion Bridge, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51870a.

PLATE XLIV.

PLATE XLIV.

a. Central lateral space of area.
h. Central muscle scar.
p. Pedicle groove.
v. Visceral cavity.

Lingulella (Lingulepis) gregwa (Matthew) (p. 554).

Figure 1. Very perfect ventral valve preserving the entire exterior surface, from Locality **10p″**, Middle Cambrian sandstones between Indian River and McPhees Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51875a.

1a. Cast of the interior of a ventral valve from Locality **10p**, Middle Cambrian sandstones of Division E2b, Dugald Brook, Cape Breton, Nova Scotia, showing the vascular sinuses. U. S. Nat. Mus. Cat. No. 51873a.

1b. Enlargement of a small ventral valve associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873b.

1c. Elongate ventral valve from Locality **10p′**, Middle Cambrian sandstones on Gregwa Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51874a.

1d. Partly exfoliated ventral valve associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873c.

1e. Small ventral valve associated with the shell represented by figure 1c, showing the cast of a long pedicle furrow and a portion of the area. U. S. Nat. Mus. Cat. No. 51874b.

1f. Cast of the interior of a very broad ventral valve associated with the shell represented by figure 1, on which a portion of the outer shell is preserved. U. S. Nat. Mus. Cat. No. 51875b.

1g. Fragment of small ventral valve associated with the shell represented by figure 1, showing the area and the character of the outer surface of the shell. U. S. Nat. Mus. Cat. No. 51875c.

1h. Cast of part of the interior of a small dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873e.

1i. Small oval dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873f.

1j. Transversely oval dorsal valve, preserving the outer surface, associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873g. The outer surface of this shell is enlarged in figure 1p.

1k. Cast of the interior of a subtriangular dorsal valve, showing the visceral area, associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873h.

1l. Cast of the interior of an elongate dorsal valve associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. No. 51873d.

1m. Cast of the interior of an elongate dorsal valve associated with the shell represented by figure 1c. U. S. Nat. Mus. Cat. No. 51874c.

1n. Cast of the interior of a dorsal valve associated with the shell represented by figure 1c. U. S. Nat. Mus. Cat. No. 51874d. The concentric lines of tubercles have been drawn in from other specimens (Cat. Nos. 51873i and 51873j from Locality **10p**).

1o. Enlargement of a portion of surface of a very perfectly preserved dorsal valve 12 mm. in length from Locality **13t″**, Middle Cambrian sandstones of Divisions E1c and E1d on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56792a.

1p. Enlargement of the surface of the dorsal valve represented in figure 1j to show the irregular, concentric, undulating ridges. U. S. Nat. Mus. Cat. No. 51873g.

Lingulella (Lingulepis) longinervis (Matthew) (p. 555).

Figures 2 and 2a. Exteriors of two small ventral valves, with nearly straight cardinal margins. Locality **13p**, Middle Cambrian sandstones 40 feet above Division E2a on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 51872a and 51872b, respectively.

2b. Partly exfoliated ventral valve, with incurved cardinal margins. Locality **13g**, Middle Cambrian sandstones 10 feet above Division E2a, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56977a.

2c. Interior of a broken ventral valve, showing visceral cavity, area of central muscle scars, etc. Locality **13f**, Middle Cambrian sandstones 20 feet above Division E2a, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56974a.

2d. Exterior of a dorsal valve from Locality **10p**, Middle Cambrian sandstones of Division E2b, on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 34764a.

2e. Interior of a dorsal valve from Locality **344o**, Middle Cambrian sandstones of Division E2b, on Dugald Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Specimen figured by Matthew [1903, Pl. VII, fig. 6f]. The two figures should be compared.

2f and 2g. Casts of parts of interiors of dorsal valves, showing position of central scars. Locality **13d**, Middle Cambrian sandstones between Divisions E2a and E2b, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. Nos. 56976a and 56976b, respectively.

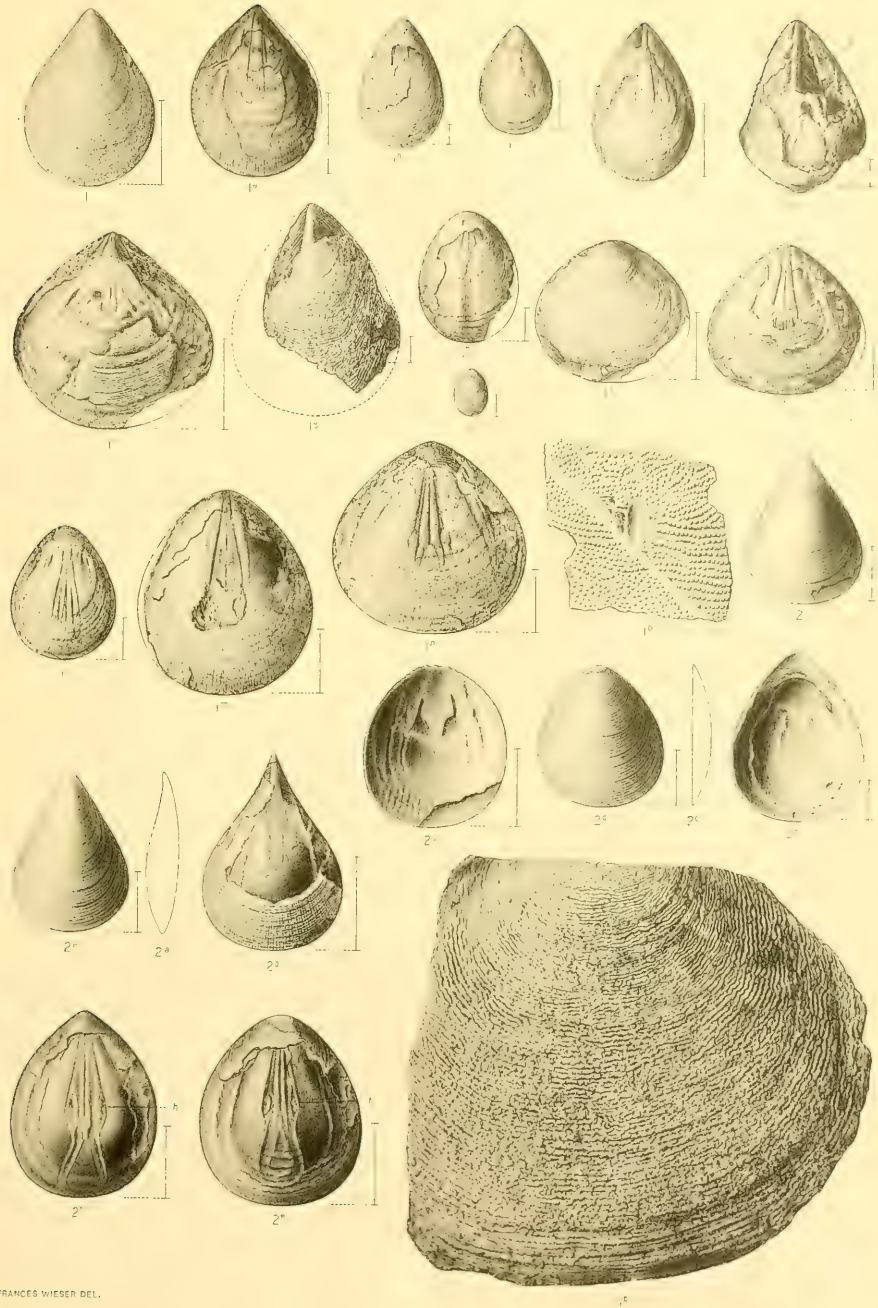


PLATE XLV.

PLATE XLV.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scars.
j. Anterior lateral muscle scars.
ps. Parietal band.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity

Lingulella radula Matthew (p. 529).

Figure 1. Imperfect cast of the interior of a ventral valve from Locality **301x**, Upper Cambrian sandstones of Division 2c of Matthew's section, Dunns Shore, Simonds, near St. John, New Brunswick. University of Toronto, Canada.

1a. Cast of an interior of a ventral valve from Locality **301y**, Upper Cambrian sandstones of Division 2c, east side of Courtney Bay, St. John, New Brunswick. University of Toronto, Canada.

1b. Slightly distorted ventral valve from the same locality as specimen represented by figure 1a. University of Toronto, Canada.

1c. Cast of the interior of a distorted ventral valve, associated with specimen represented by figure 1a. University of Toronto, Canada.

1d. Cast of the interior of a dorsal valve, the type specimen, showing central scars, etc., associated with the specimen represented by figure 1. University of Toronto, Canada.

Figures 1, 1a–d, and 1f are drawn from the specimens upon which Matthew based his figures [1891, Pl. XV, figs. 7a–b and 8a–e], but closer identification is impossible.

1e. Cast of the interior of a distorted ventral valve from the locality represented by figure 1a. Museum of Comparative Zoology, Cambridge, Massachusetts.

1f. Cast showing part of the interior of a dorsal valve, associated with the specimens represented by figures 1a–c. University of Toronto, Canada. (See note following the description of figure 1d.)

1g. Small ventral valve, preserving the exterior surface and convexity of outline in an unusually perfect manner. Locality same as specimen represented by figure 1a. Museum of Comparative Zoology, Cambridge, Massachusetts. (See note in description of figures 1k and 1l.)

1h. Interior of a ventral valve, preserving the form of the heart-shaped cavity as in *Obolus*. Locality same as specimen represented by figure 1a. Museum of Comparative Zoology, Cambridge, Massachusetts.

1i. Cast of the interior of a ventral valve, showing the visceral cavity and main vascular sinuses with unusual clearness. Locality same as specimen represented by figure 1a. Museum of Comparative Zoology, Cambridge, Massachusetts.

1j. Cast of the interior of a dorsal valve, showing muscle scars, etc., beautifully preserved. Locality same as specimen represented by figure 1a. Museum of Comparative Zoology, Cambridge, Massachusetts.

1k and 1l. Interior of dorsal valve and cast of same. Locality same as specimen represented by figure 1a. Museum of Comparative Zoology, Cambridge, Massachusetts. It may be that the specimens represented by figures 1g, 1k, and 1l represent a small species distinct from *Lingulella radula*. All of the specimens are more or less distorted in the arenaceous shales in which they are embedded.

Lingulella triparilis (Matthew) (p. 536).

[Text figs. 44*a–l*, p. 537.]

Figure 2. Broad form of ventral valve from Locality **13t′**, Middle Cambrian sandstones of Division E1b on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 57013a.

2a and 2a′. Narrow form of ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 57013b.

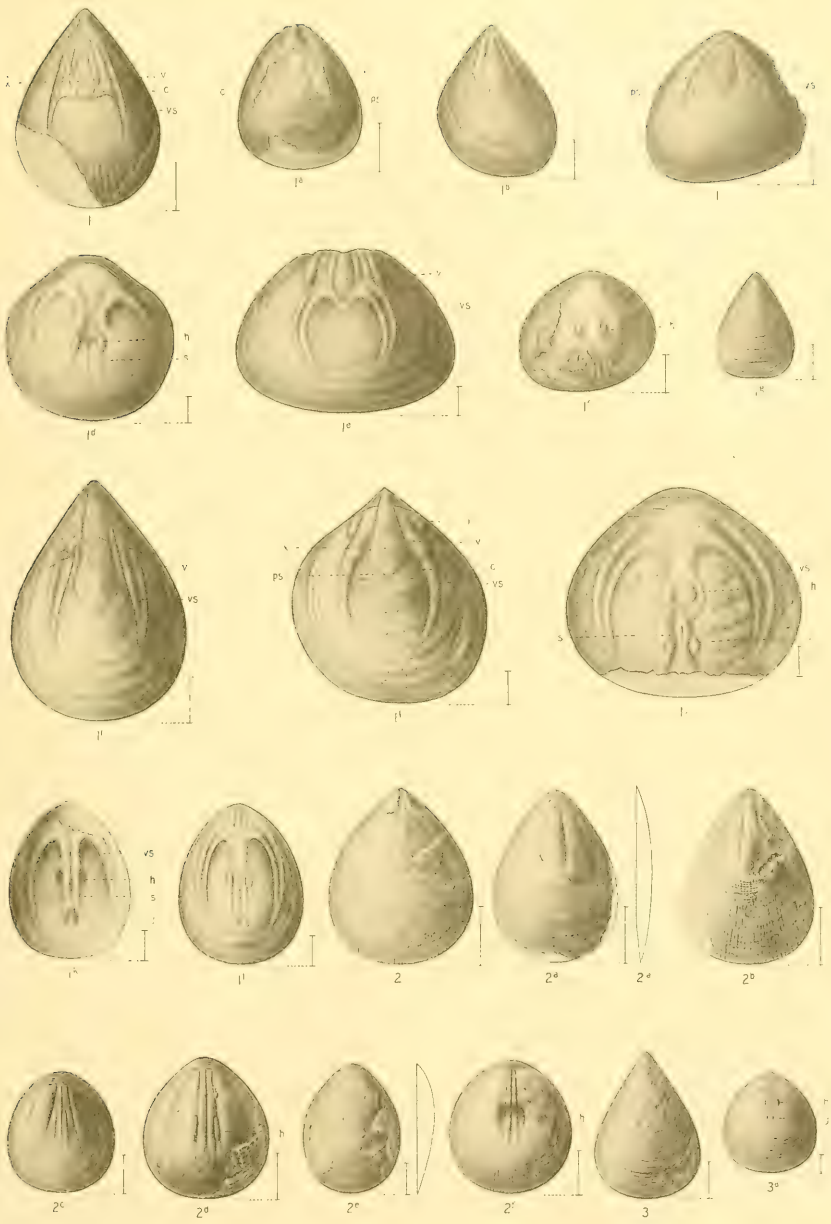
2b. Ventral valve on which a portion of the exterior surface of the shell is preserved. Associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 57013c.

2c. Cast of interior of a dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 57013d.

2d. Cast of interior of a dorsal valve from Locality **13t″**, Middle Cambrian sandstones of Divisions E1c and E1d, on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 57012a.

2e. Narrow form of dorsal valve associated with the specimen represented by figure 2, preserving a portion of the outer shell, with side outline. U. S. Nat. Mus. Cat. No. 57013e. Another specimen (Cat. No. 51855a, from Locality **13t**) was used in restoring certain portions of this figure.

2f. Broad form of dorsal valve, associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 57013f.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

LINGULELLA (LINGULEPIS) PUMILA (Matthew) (p. 556).

FIGURE 3. Exterior of ventral valve, the type specimen. University of Toronto, Canada.
3a. Exfoliated dorsal valve, showing muscle scars. University of Toronto, Canada.

Figures 3 and 3a are drawn from the specimens illustrated by Matthew [1903, Pl. VII, figs. 5a and 5b, respectively]. The specimens represented are both from Locality **344f**, Middle Cambrian, shales of the Coldbrook of Matthew, on Dugald Brook, Cape Breton, Nova Scotia.

PLATE XLVI.

PLATE XLVI.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
p. Pedicle groove.
v. Visceral cavity.

Obolus (Westonia) aurora (Hall) (p. 451).

Figure 1. Compressed ventral valve, from which the outer shell has been exfoliated. Locality **S85x**, Upper Cambrian sandstone near Mazomanie, Dane County, Wisconsin. U. S. Nat. Mus. Cat. No. 51681a. The area is enlarged in figure 1c.

1a. Cast of the interior of a compressed ventral valve associated with the specimen represented by figure 1. The visceral area (v) recalls the heart-shaped pit of *Lingulella acutangula* (Pl. XVII, fig. 1f). The central muscle scars were located in the area (c), but are not clearly defined. U. S. Nat. Mus. Cat. No. 51681b.

1b. Compressed ventral valve associated with the specimen represented by figure 1, showing concentric and radiating lines and striæ as preserved on the cast of the interior of the shell. U. S. Nat. Mus. Cat. No. 51681c. The area is enlarged in figure 1d.

1c. Enlargement of the area of figure 1. U. S. Nat. Mus. Cat. No. 51681a.

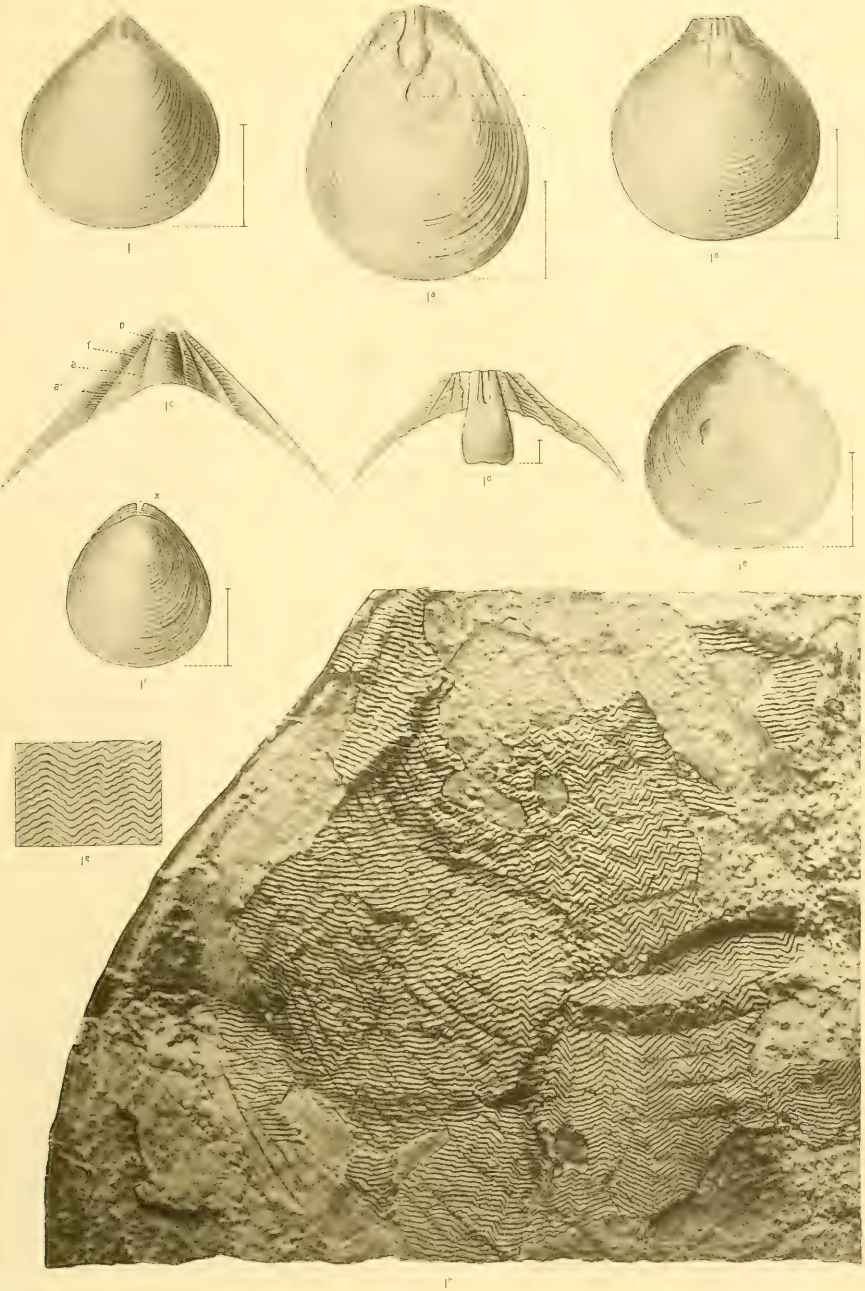
1d. Enlargement of the area of figure 1b, to show the apron-like area mentioned in the text (p. 452). U. S. Nat. Mus. Cat. No. 51681c.

1e. Cast of the exterior of a dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 51681d.

1f. Cast of the interior of a dorsal valve associated with the specimen represented by figure 1. The shell is compressed and the area broken at x'. U. S. Nat. Mus. Cat. No. 51681e.

1g. Enlargement of a portion of the central part of the surface of the shell figured in 1h, to show the irregular lamellose character of the striæ. Locality **85s**, Upper Cambrian sandstone at Prairie du Sac, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. No. 51680a.

1h. Part of the shell represented in figure 1g, greatly enlarged by photography to illustrate the character of the outer surface. U. S. Nat. Mus. Cat. No. 51680a.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE XLVII.

PLATE XLVII.

a. Central lateral space of area.
a'. Outer lateral space of area.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
p. Pedicle groove.
ps. Parietal band.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.

Obolus (Westonia) ella (Hall and Whitfield) (p. 455).

[Pl. XXXIII, figs. 3, 3a–c.]

Figure 1. Ventral valve laterally compressed and flattened, from Locality **30a**, Middle Cambrian siliceous shale in Big Cottonwood Canyon, southeast of Salt Lake City, Utah. U. S. Nat. Mus. Cat. No. 51691a.

1a. Dorsal valve associated in the same bed of shale with specimen represented by figure 1, but it is not compressed laterally. Neither specimen preserves any of the shell substance. U. S. Nat. Mus. Cat. No. 51691b.

1b. Enlarged figure of the type specimen, a dorsal valve, from Locality **329**, Middle Cambrian shales near Calls Fort, Boxelder County, Utah. U. S. Nat. Mus. Cat. No. 15321a. Specimen figured by Hall and Whitfield [1877, Pl. I, fig. 8] as *Lingulepis ella;* and by Walcott [1886b, Pl. VIII, fig. 4; and 1891a, Pl. LXVII, fig. 2b] as *Lingulella ella.*

1c. Cast of the interior of a slightly distorted ventral valve from Locality **329e**, Middle Cambrian siliceous shales of East Canyon, above Ophir, Oquirrh Range, Tooele County, Utah. U. S. Nat. Mus. Cat. No. 15320a.

1d. Another cast of the interior of a ventral valve that is associated with the specimen represented by figure 1c, but which has suffered less from distortion. U. S. Nat. Mus. Cat. No. 15320b. Specimen figured by Walcott [1898b, Pl. XXVIII, fig. 7] as *Obolus* (*Lingulella*) *ella.*

1e and 1f. Ventral and dorsal valves of young shells associated with the shells represented by figures 1 and 1a. U. S. Nat. Mus. Cat. Nos. 51691c and 51691d, respectively.

1g. Impression of the interior of a ventral valve from Locality **302s**, Middle Cambrian shale in Last Chance Gulch, south of Helena, Montana. U. S. Nat. Mus. Cat. No. 51686a. Specimen figured by Walcott [1898b, Pl. XXVIII, fig. 5] as *Obolus* (*Lingulella*) *ella.*

1h and 1i. Interior casts of ventral and dorsal valves flattened in argillaceous shales of Locality **31**, Middle Cambrian, at the Chisholm mine, near Pioche, Nevada. U. S. Nat. Mus. Cat. Nos. 15319a and 15319b, respectively. The specimen represented by figure 1i was figured by Walcott [1898b, Pl. XXVIII, fig. 8] as *Obolus* (*Lingulella*) *ella.*

1j. Cast of the interior of a small ventral valve with a very high area, from Locality **4g**, Middle Cambrian shale 1 mile north of the forks of East and West Gallatin rivers, Montana. U. S. Nat. Mus. Cat. No. 51685a.

1k. Impression of the interior of a slightly distorted dorsal valve from the same locality as specimen represented by figure 1g, showing the characteristic muscular impressions. U. S. Nat. Mus. Cat. No. 51686b. Specimen figured by Walcott [1898b, Pl. XXVIII, fig. 6] as *Obolus* (*Lingulella*) *ella.*

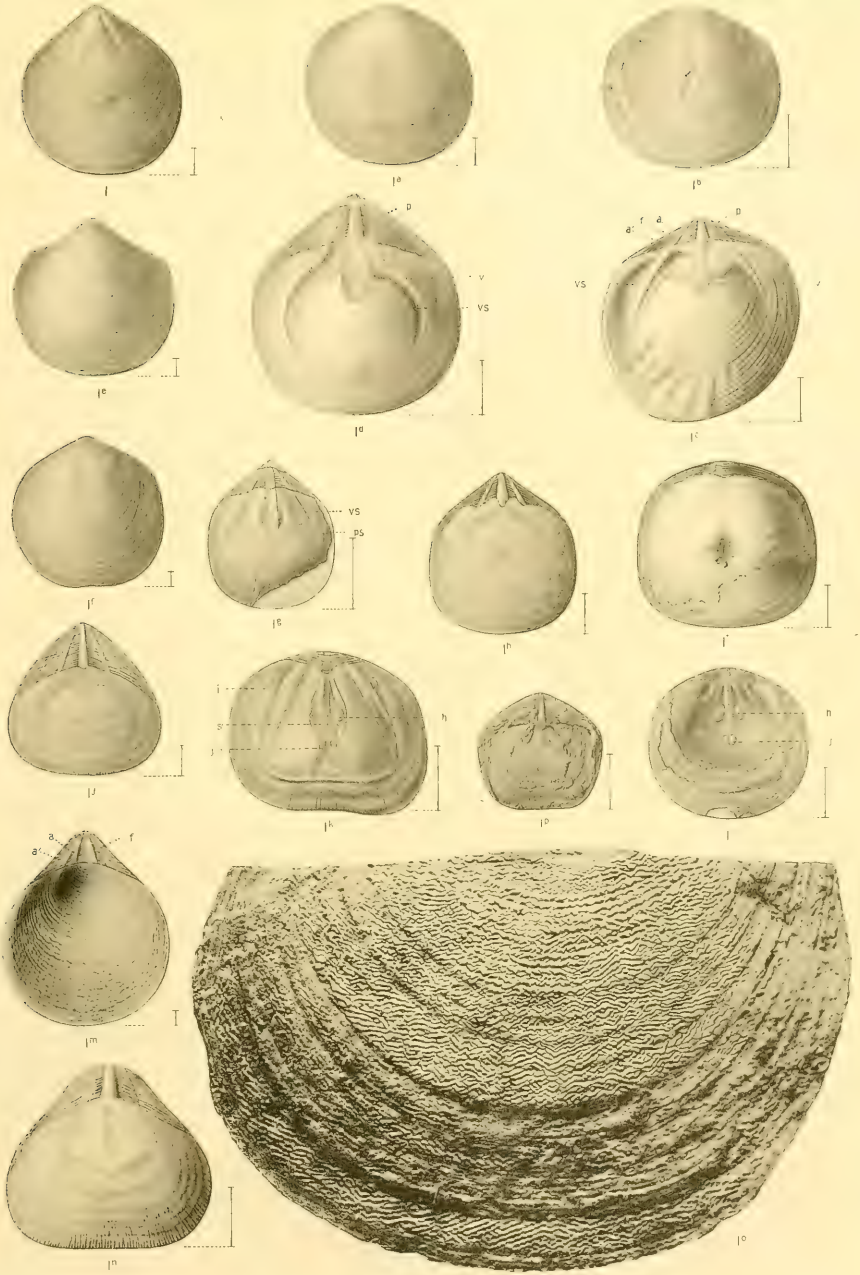
1l. Interior of finely preserved dorsal valve from Locality **5h**, Middle Cambrian shales 2 miles southeast of Malade, Idaho. U. S. Nat. Mus. Cat. No. 51689a.

1m. Enlargement of a small individual associated with the shells represented by figures 1h and 1i, showing characteristic surface markings. U. S. Nat. Mus. Cat. No. 15319c. The counterpart of this specimen (Cat. No. 15319d) was used to aid in restoring certain portions of figure 1m.

1n. Cast of an interior of a ventral valve associated with the ventral valve represented by figure 1j. U. S. Nat. Mus. Cat. No. 51685b.

1o. Enlargement by photography of the surface of a specimen associated with the shell represented by figure 1j. U. S. Nat. Mus. Cat. No. 51685c.

1p. Distorted ventral valve from Locality **90**, Middle Cambrian shales near Craigs Mountain, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 51634a.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE XLVIII.

PLATE XLVIII.

h. Central muscle scar.
l. Outside lateral muscle scar.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Obolus (Westonia) euglyphus (Walcott) (p. 461).

Figures 1 and 1a. Two associated, partly exfoliated ventral valves that illustrate variation in form, and the strong lamellæ of the anterior portion of the shell. Locality **74**, Middle Cambrian sandstone at the head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 27316a and 27316b, respectively.

1b. Exfoliated ventral valve associated with the specimens represented by figures 1 and 1a, showing the fine radiating striæ on the inner layer of the shell. U. S. Nat. Mus. Cat. No. 27316c.

1c. Cast of the interior of a ventral valve, the type specimen, associated with the specimens represented by figures 1 and 1a, showing the character of the area, visceral cavity, and main vascular sinuses. U. S. Nat. Mus. Cat. No. 27316d.

1d. Cast of the interior of a ventral valve from Locality **74c**, Middle Cambrian sandstone at the head of Lava Canyon, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 57023a.

1e. Cast of the interior of a dorsal valve, associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 57023b. Another specimen (Cat. No. 27316e from Locality **74**) was used to aid in restoring certain portions of this figure.

1f. Enlargement of a portion of the surface near the umbo, to illustrate the irregular inosculating striæ. Associated with the shells represented by figures 1 and 1a. U. S. Nat. Mus. Cat. No. 27316f.

Lingulella lineolata (Walcott) (p. 515).

Figure 2. Small, obtuse ventral valve from which the shell has been largely exfoliated. Locality **73a**, Middle Cambrian sandstone in Chuar Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 27324a.

2a. Acuminate ventral valve associated with the shell represented by figure 2, showing a portion of the inner layers, marked by fine radiating striæ. U. S. Nat. Mus. Cat. No. 27324b.

2b. Very perfect dorsal valve, the type specimen, from Locality **73**, Middle Cambrian sandstones in Kwagunt Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 27325a.

2c and 2d. Partly exfoliated dorsal valves associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. Nos. 27324c and 27324d, respectively.

2e and 2f. Associated ventral and dorsal valves from Locality **74**, Middle Cambrian sandstones at the head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. Nos. 27326a and 27326b, respectively.

2g. Partly exfoliated dorsal valve, more broadly oval than usual, associated with the shell represented by figure 2b. U. S. Nat. Mus. Cat. No. 27325b.

2h. A very fine illustration of a rather large dorsal valve, associated with the shell represented by figure 2b. U. S. Nat. Mus. Cat. No. 27325c.

2i and 2j. United ventral and dorsal valves with side view, from Locality **74d**, Middle Cambrian sandstone in Bass Canyon, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 51820a.

2k and 2l. Casts of rather large ventral and dorsal valves that are referred to this species. They are associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. Nos. 27324e and 27324f, respectively.

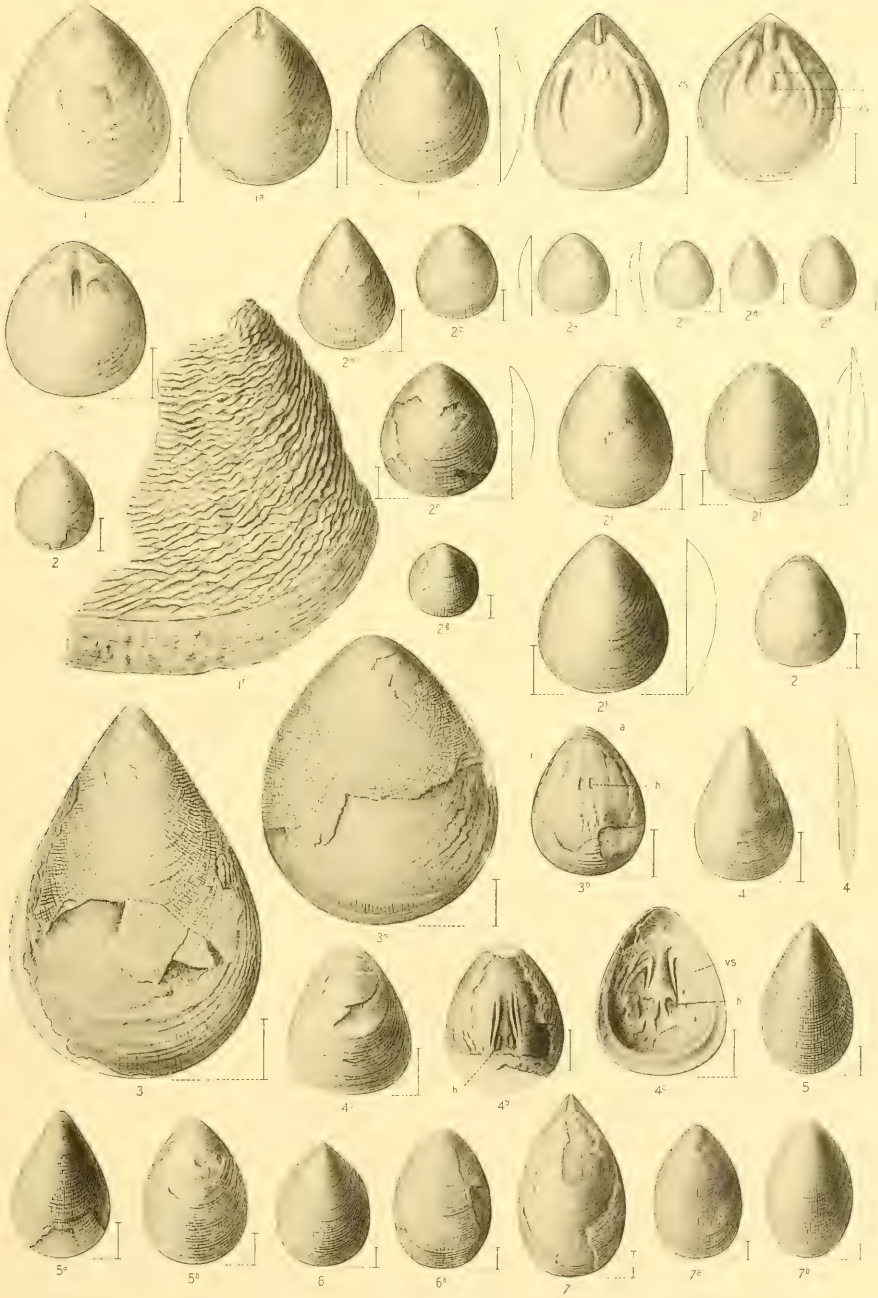
Obolus (Westonia) finlandensis Walcott (p. 462).

Figure 3. Exterior of ventral valve, the type specimen, illustrating form and surface characters. U. S. Nat. Mus. Cat. No. 35296a.

3a. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 35296b.

3b. Cast of part of interior of dorsal valve. U. S. Nat. Mus. Cat. No. 35296c.

The specimens represented are all from Locality **311x**, Middle Cambrian limestone at Saltvik, Åland Island, Finland.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

Obolus (Westonia) bottnicus (Wiman) (p. 454).

Figures 4 and 4′. Top and side views of an almost perfectly preserved ventral valve, the type specimen. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57089a).

4a. Exterior of a partly exfoliated dorsal valve. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57089b.)

4b. Imperfect cast of the interior of a dorsal valve. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57089c).

4c. Interior of a dorsal valve. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57089d).

Figures 4, 4a–c are drawn from the specimens illustrated by Wiman [1902, Pl. II, figs. 41–44, respectively] as *Lingula bottnica*. The specimens represented are all from Locality **311**, Middle? Cambrian drift bowlder of sandstone on Eggegrund Island, Gefle Bay, Sweden.

Obolus (Westonia) wimani Walcott (p. 467).

Figure 5. Exterior of ventral valve from Locality **311c**, Middle? Cambrian drift bowlder No. 7 on Biludden, Gefle Bay, Sweden. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57090a). Type specimen, figured by Wiman [1902, Pl. II, fig. 30] as *Lingulella* sp. No. 1.

5a. Exterior of ventral valve from Locality **311g**, Middle? Cambrian drift bowlder No. 16 on Biludden, Gefle Bay, Sweden. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57091a). Specimen figured by Wiman [1902, Pl. II, fig. 31] as *Lingulella* sp. No. 2.

5b. Partly exfoliated dorsal valve from Locality **311t**, Middle? Cambrian drift bowlder at Öfverby, Åland Island, Finland. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57092a). Specimen figured by Wiman [1902, Pl. II, fig. 32] as *Lingulella* sp. No. 7.

Obolus (Westonia) ålandensis Walcott (p. 451).

Figure 6. Exterior of ventral valve from Locality **311j**, Middle? Cambrian drift bowlder No. 28 on Biludden, Gefle Bay, Sweden. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57093a). Specimen figured by Wiman [1902, Pl. II, fig. 33] as *Lingulella?* sp. No. 3.

6a. Exterior of a dorsal valve from Locality **311y**, Middle? Cambrian drift bowlder at Ytternäs, Åland Island, Finland. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57094a). Type specimen, figured by Wiman [1902, Pl. II, fig. 35] as *Lingulella?* sp. No. 5.

Obolus (Westonia) balticus Walcott (p. 453).

Figure 7. Partly exfoliated ventral valve from Locality **311t**, Middle? Cambrian drift bowlder at Öfverby, Åland Island, Finland. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57095a). Specimen figured by Wiman [1902, Pl. II, fig. 34] as *Lingulella?* sp. No. 6.

7a. Dorsal valve from Locality **311o**, Middle? Cambrian drift bowlder on Skälstenarne Island, Gefle Bay, Sweden. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57096a). Specimen figured by Wiman [1902, Pl. II, fig. 37] as *Lingulella?* sp. No. 4.

7b. Dorsal valve from Locality **311h**, Middle? Cambrian drift bowlder No. 26, on Biludden, Gefle Bay, Sweden. Specimen in the collection of the University of Upsala, Sweden; cast in the United States National Museum (Cat. No. 57097a). Type specimen, figured by Wiman [1902, Pl. II, fig. 38] as *Lingulella?* sp. No. 4.

PLATE XLIX.

PLATE XLIX.

a. Central lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Obolus (Westonia) escasoni (Matthew) (p. 459).

Figure 1. Cast of the interior of a ventral valve, showing continuation of cast of pedicle furrow, with the central depression of the visceral area. University of Toronto, Canada.

1a. Interior of ventral valve, showing heart-shaped cavity and position of central muscle scars; also a strongly pitted and striated interior surface. University of Toronto, Canada. Type specimen, figured by Matthew [1901a, Pl. V, fig. 1g] as *Lingulella (?) escasoni*.

1aa. Enlargement of the central portion of figure 1a to show the position and size of the muscle scars, surface pits, etc.

1b. Cast of the interior of a rather large dorsal valve. University of Toronto, Canada. Specimen is probably the one illustrated by Matthew [1901a, Pl. V, fig. 1d] as *Lingulella (?) escasoni*.

1c, 1d, and 1e. Interior of dorsal valves, showing the position of muscle scars. University of Toronto, Canada.

1f. Enlargement of the exterior surface of a shell 3 mm. long, to show radiating striæ, lines of growth, and transverse undulating lines. University of Toronto, Canada.

The figures are all drawn from specimens in Matthew's figured material, but except in the cases noted (figs. 1a and 1b) identification is impossible. The specimens represented are all from Locality **325**, Upper Cambrian shales on McAdam Shore, East Bay, Cape Breton, Nova Scotia.

Obolus (Westonia) stoneanus (Whitfield) (p. 465).

[Pl. XXVIII, figs. 2, 2a–g.]

Figure 2. A dorsal valve from Locality **11c**, Upper Cambrian sandstone near Newton, New Jersey.

2a. Enlargement of the exterior surface of the specimen represented by figure 2.

The specimen represented was figured by Weller [1903, Pl. I, fig. 6] as *Lingulella stoneana*.

Lingulella texana Walcott (p. 535).

Figure 3. Partly exfoliated dorsal valve, showing strong radiating striæ which characterize the species. Locality **69**, Upper Cambrian limestone near Honey Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 51805a.

3a. Cast of a dorsal valve, the type specimen, showing the area and muscle scars. Locality **70**, Upper Cambrian limestone near Morgans Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 51806a. Copied from Walcott [1908d, Pl. VIII, fig. 5].

Obolus (Westonia) iphis Walcott (p. 462).

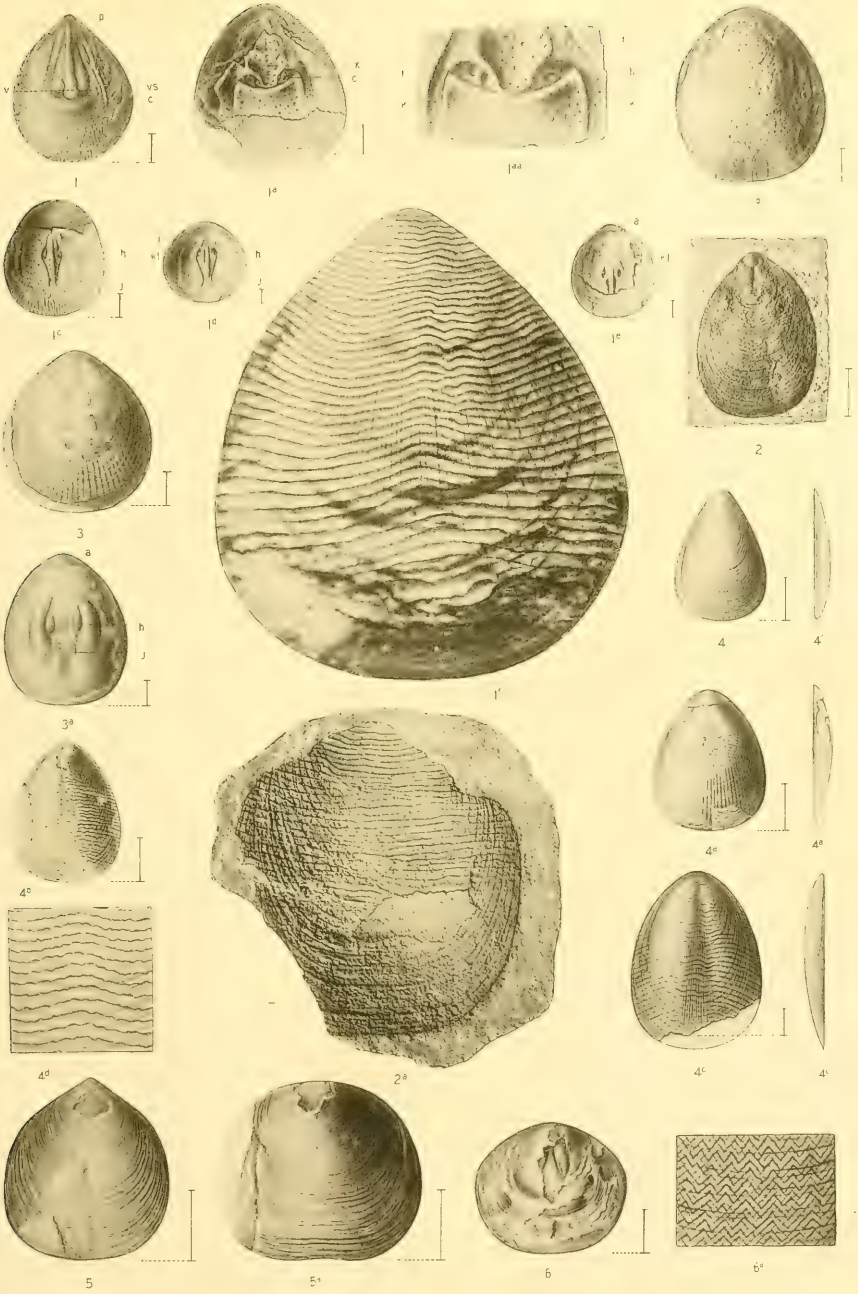
Figures 4 and 4′. Ventral valve from which the outer layer of shell has been exfoliated. Locality **64**, Upper Cambrian limestone near the Bullwhacker mine, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 51720a.

4a and 4a′. Partly exfoliated dorsal valve from Locality **201a**, Lower Ordovician limestone east of Hamburg Ridge, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 51542a.

4b. Dorsal valve preserving most of the outer layer of the shell, the type specimen, associated with the shell represented by figure 4a. U. S. Nat. Mus. Cat. No. 51542b.

4c. Dorsal valve associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 51720b.

4d. Enlargement of a portion of the outer surface of the shell represented in figure 4b. U. S. Nat. Mus. Cat. No. 51542b.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

Obolus (Westonia) wasatchensis Walcott (p. 466).

[Text figs. 41A–F, p. 467.]

Figure 5. Compressed and crushed ventral valve. U. S. Nat. Mus. Cat. No. 57098a.
5a. Dorsal valve flattened in the siliceous shale. U. S. Nat. Mus. Cat. No. 57098b.

The specimens represented are both from Locality **32x**, Middle Cambrian shale in Wasatch Canyon, Boxelder County, Utah.

Obolus (Westonia) ella onaquiensis Walcott (p. 459).

Figure 6. Compressed, exfoliated dorsal valve, the type specimen. U. S. Nat. Mus. Cat. No. 51716a.
6a. Enlargement of the surface of another specimen to show the zigzag, transverse striæ. U. S. Nat. Mus. Cat. No. 51716b.

The specimens represented are both from Locality **33f**, Middle Cambrian shales, Onaqui Range, Tooele County, Utah.

PLATE L.

PLATE L.

a. Central lateral space of area.
a′. Outer lateral space of area.
b. Boss (see text description, p. 571).
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
g. Umbonal muscle scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
mr. Median ridge.
p. Pedicle groove.
ps. Parietal band.
s. Median septum.
vs. Main vascular sinus.
x. Heart-shaped cavity.

Bicia gemma (Billings) (p. 569).

Figures 1 and 1b. Exterior and side view of a ventral valve with the outer surface partly removed by erosion. Locality **27**, Lower Cambrian limestone near Troy, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 15349a.

1a. Exterior of a ventral valve associated with the specimen represented by figure 1, preserving the interrupted radiating striæ of the outer surface. U. S. Nat. Mus. Cat. No. 15349b.

1c and 1c′. Exterior of two dorsal valves, associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 15349c and 15349d, respectively. Specimen figured by Walcott [1886b, Pl. X, fig. 2e] as *Obolella gemma*.

1d. Posterior portion of a ventral valve associated with the shell represented by figure 1, on which the concentric and radiating lines are very strong (see fig. 1e). U. S. Nat. Mus. Cat. No. 15349e.

1e. Outer surface of a ventral valve from Locality **2b**, Lower Cambrian limestone near Beman Park, Troy, New York, greatly enlarged. This may possibly be the surface of *Bicia whiteavesi*. U. S. Nat. Mus. Cat. No. 51900a.

1f. Natural cast of interior of ventral valve from Locality **2o**, Lower Cambrian limestone bowlders at east entrance to Bic Harbor, Quebec. U. S. Nat. Mus. Cat. No. 14889d.

1g. Natural cast of interior of ventral valve associated with the specimen represented by figure 1e, at Troy, New York. U. S. Nat. Mus. Cat. No. 51900b. Another specimen (Cat. No. 51900c) was used to aid in restoring certain portions of this figure.

1h, 1i, and 1k. Interiors of ventral valves showing variation in area, thickening of shell, etc. They are associated with the specimen represented by figure 1f, at Bic Harbor, Canada. U. S. Nat. Mus. Cat. Nos. 14889c, 14889b, and 14889a, respectively. The specimens represented by figures 1i and 1k were illustrated by Walcott [1886b, Pl. X, figs. 2b and 2d, respectively] as *Obolella gemma*. The specimen illustrated by Walcott [1886b, Pl. X, fig. 2] is not figured in this monograph.

1j. Interior of ventral valve, with thick shell growth, from Locality **27**, Lower Cambrian limestone near Troy, New York. U. S. Nat. Mus. Cat. No. 15349e. Specimen figured by Walcott [1886b, Pl. X, fig. 2c] as *Obolella gemma*.

1l. Natural cast of a distorted dorsal valve associated with the specimen represented by figure 1e, at Troy, New York. U. S. Nat. Mus. Cat. No. 51900d.

1m. Interior of a dorsal valve associated with the shell represented by figure 1f at Bic Harbor, Canada. U. S. Nat. Mus. Cat. No. 14889f.

1n. Interior of dorsal valve from Locality **2b**, Lower Cambrian limestone near Beman Park, Troy, New York. U. S. Nat. Mus. Cat. No. 51900e. This drawing is based on one fairly well preserved interior, but the anterior lateral muscle scars and some other details are taken from five other associated specimens (Cat. Nos. 51900f–j).

Bicia whiteavesi Walcott (p. 570).

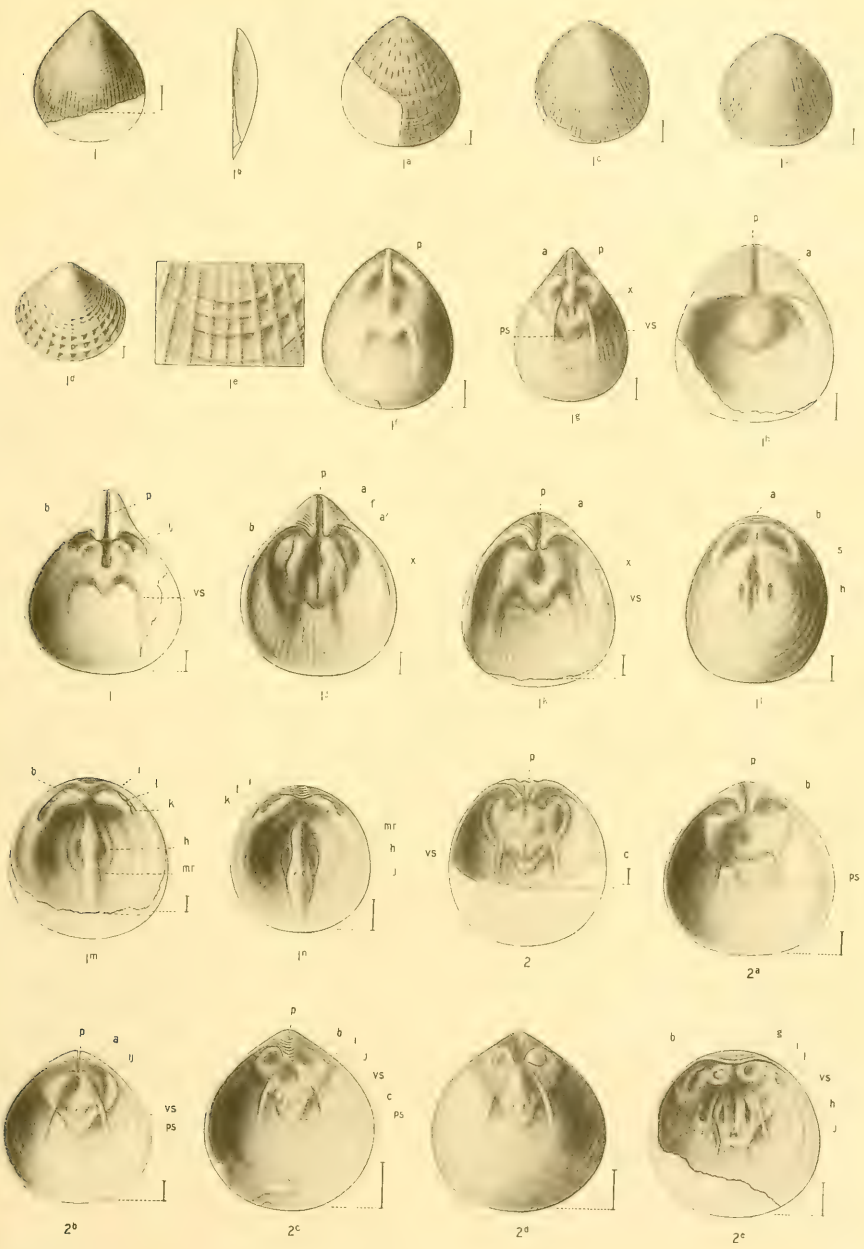
Figures 2, 2a, and 2b. Interiors of ventral valves, showing transition from short form of ventral valve of *B. gemma*, figure 1k, to the typical ventral valve of *B. whiteavesi*, figure 2c. U. S. Nat. Mus. Cat. Nos. 35260a, 35260b, and 35260c, respectively.

2c. Interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35260d.

2d. Natural cast of the interior of the specimen represented by figure 2c. U. S. Nat. Mus. Cat. No. 35260e.

2e. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35260f.

The specimens represented are all from Locality **2b**, Lower Cambrian limestone near Beman Park, Troy, New York.



FRANCES WIESER DEL.

PLATE LI.

PLATE LI.

f. Flexure lines.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
r. Area of posterior adductor scar.
r'. Area of anterior adductor scar
s. Median septum.
v. Visceral cavity.
vs. Vascular sinus.
ivs. Central lateral branches of vascular system.
x. Heart-shaped cavity.

ELKANIA DESIDERATA (Billings) (p. 562).

FIGURE 1. Interior of a ventral valve, showing reversed area and muscle scars. U. S. Nat. Mus. Cat. No. 51943a.

1a. Cast of interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51943b.

1b. Cast of interior of dorsal valve, showing main vascular sinuses with branches extended over central area. U. S. Nat. Mus. Cat. No. 51943c.

1c. Cast of interior of dorsal valve, showing central area defined, but no traces of branches of main vascular sinuses. This central area has been interpreted as probably the area of attachment of muscles, by authors who have written of the species. U. S. Nat. Mus. Cat. No. 51943d.

1d. Cast of interior of a dorsal valve in which the visceral area is beautifully defined, but the vascular sinuses and the central area included within them are not defined. U. S. Nat. Mus. Cat. No. 51943e.

The specimens represented are all from Locality **319a**, Lower Ordovician shales, at Point Levis, Quebec.

ELKANIA AMBIGUA (Walcott) (p. 562).

FIGURE 2. Exterior of ventral valve. This specimen can not be located and the locality number is not known. The figure, however, is a new drawing of the specimen illustrated by Walcott [1884b, Pl. I, fig. 2b] as *Obolella? ambigua*.

2a. Partly exfoliated dorsal valve, showing the outlines of the visceral area and main vascular sinuses on the inner lamellations of the shell. U. S. Nat. Mus. Cat. No. 24554a. Type specimen, figured by Walcott [1884b, Pl. I, fig. 2a] as *Obolella? ambigua*.

2b. Interior of a dorsal valve, showing visceral area, muscle scars, and main vascular sinuses. U. S. Nat. Mus. Cat. No. 24554b. Specimen figured by Walcott [1884b, Pl. I, fig. 2c] as *Obolella? ambigua*.

2c. Cast of the interior of a dorsal valve in which the thickening of the shell within the lines of the main vascular sinuses is greater than in any other specimen. The visceral area also extends farther forward into the valve. This variation in the forward extension of the visceral area is not infrequent in species of *Obolus*. U. S. Nat. Mus. Cat. No. 24554c.

The specimens represented by figures 2a–c are all from Locality **63**, Lower Ordovician limestone, northeast of Adams Hill, Eureka district, Nevada.

OBOLUS (FORDINIA) BELLULUS (Walcott) (p. 428).

FIGURE 3. Top and side views of a partly exfoliated ventral valve from Locality **7z**, Upper Cambrian limestone, about 3 miles southeast of Emigrant Pass, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 51944g.

3a. Interior of a ventral valve, the type specimen, showing central trapezoidal area at x; also main vascular sinuses, pedicle groove, etc. U. S. Nat. Mus. Cat. No. 51944a.

3b and 3c. Casts of interior of ventral valves. U. S. Nat. Mus. Cat. Nos. 51944b and 51944c, respectively.

3d. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 51944d.

3e. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 51944e.

3f. Cast of interior of dorsal valve. U. S. Nat. Mus. Cat. No. 51944f.

The specimens represented by figures 3a–f are from Locality **7x**, Upper Cambrian limestones about 2.5 miles southeast of Emigrant Pass, Silver Peak quadrangle, Esmeralda County, Nevada.

FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

ELKANIA IDA (Billings) (p. 563).

[Pl. XXX, figs. 20 and 20a.]

FIGURES 4 and 4a. Top and side views of a partly exfoliated ventral valve. Geol. Survey Canada.

4b. Cast of the interior of a dorsal valve, showing elevated visceral cavity and muscle scars. Geol. Survey Canada.

4c. Interior of a ventral valve, preserving a portion of the reversed area. Geol. Survey Canada.

The specimens represented are all from Locality **319i**, limestone No. 2 of Billings's section, at Point Levis, Quebec.

OBOLUS (FORDINIA) GILBERTI Walcott (p. 429).

FIGURES 5, 5a, and 5c. Side and top views of ventral valves varying in outline and convexity. U. S. Nat. Mus. Cat. Nos. 51946a, 51946c, and 51946d, respectively. Figure 5, the type specimen, is copied from Walcott [1908d, Pl. VII, fig. 15].

5b. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 51946b. Copied from Walcott [1908d, Pl. VII, fig. 15a].

5d. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 51946e.

The specimens represented are all from Locality **11n**, Middle Cambrian limestone southeast of Marjum Pass. House Range, Utah.

SCHUCHERTINA CAMBRIA Walcott (p. 585).

FIGURES 6, 6′, and 6″. Exterior, side, and back views of a partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51411a.

6a. Exterior of a large, partly exfoliated ventral valve with a slight median fold. U. S. Nat. Mus. Cat. No. 51411b.

6b. Cast of the interior of a ventral valve, the type specimen, showing flabelliform muscle scars. U. S. Nat. Mus. Cat. No. 51411c.

6c. Interior of the ventral valve represented by figure 6b, drawn from a cast of that specimen. U. S. Nat. Mus. Cat. No. 51411c. Parts of this figure are restored from other specimens.

6d and 6d′. Top, back, and side views of a cast of the interior of a slightly distorted ventral valve. U. S. Nat. Mus. Cat. No. 51411d.

6e. Interior of the ventral valve represented by figure 6d, obtained by making a cast of that specimen. U. S. Nat. Mus. Cat. No. 51411d.

6f. Top and side view of a cast of a dorsal valve. U. S. Nat. Mus. Cat. No. 51411e.

6g. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51411f.

6h. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51411g.

6i. Interior of the ventral valve represented by figure 6h obtained by making a cast of that specimen. U. S. Nat. Mus. Cat. No. 51411g.

6j. Cast of the interior of a dorsal valve, showing mesial area and vascular markings. U. S. Nat. Mus. Cat. No. 51411h.

6k. Enlargement of the central portion of figure 6j.

6 l. Cast of the posterior portion of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51411i.

6m. Interior of the posterior portion of the dorsal valve represented by figure 6 l, obtained by making a cast of that specimen. U. S. Nat. Mus. Cat. No. 51411i.

The specimens represented by figures 6, 6a–m are from Locality **5k**, Middle Cambrian limestones on the road to Wolsey, about 8 miles south of Neihart, Little Belt Mountains, Montana.

PLATE LII.

PLATE LII.

a. Area of dorsal valve.
cl. Cardinal muscle scar.
h. Central scars.
p. Cast of pedicle groove.
s. Median septum.
sh. Cast of exterior of cardinal area on each side of pedicle furrow.
v. Visceral area.
vs. Main vascular sinus.

DICELLOMUS POLITUS (Hall) (p. 575).

[Text figs. 16A–B, p. 314, and 49A–B, p. 576.]

FIGURE 1. Ventral valve. The specimen from which this figure was drawn can not now be located. The locality and catalogue number are therefore unknown.

1a. Ventral valve from Locality **98**, Upper Cambrian sandstone at Eau Claire, Wisconsin. U. S. Nat. Mus. Cat. No. 35211a.

1b. Exterior and side views of ventral valve from Locality **78a**, Upper Cambrian sandstone on Mount Washington, near Eau Claire, Wisconsin. U. S. Nat. Mus. Cat. No. 27447a.

1c and 1d. Casts of interiors of ventral valves associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. Nos. 35211b and 35211c, respectively. The specimen represented by figure 1c was figured by Walcott [1899, Pl. LX, fig. 4a].

1e. Partly exfoliated ventral valve in which the visceral area extends forward of the center of the valve. Locality **82b**, Upper Cambrian sandstone near Taylors Falls, Minnesota. U. S. Nat. Mus. Cat. No. 51916a.

1f. Dorsal valve associated with the shell represented by figure 1e. U. S. Nat. Mus. Cat. No. 51916b.

1g and 1h. Exteriors and side outlines of dorsal valves associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. Nos. 35211d and 35211e, respectively.

1i. Interior of a ventral valve, associated with the shell represented by figure 1a, showing excavated area on each side of the median line of the flattened posterior margin. U. S. Nat. Mus. Cat. No. 35211f.

1j. Interior of a ventral valve, associated with the shell represented by figure 1a, showing large composite muscle scars (cl), median septum (s), vascular sinuses (vs), and area. U. S. Nat. Mus. Cat. No. 35211g. Specimen figured by Walcott [1899, Pl. LX, fig. 4].

1k. Cast of interior of a dorsal valve associated with the shell represented by figure 1a. U. S. Nat. Mus. Cat. No. 35211h.

2 and 2a. Partly exfoliated ventral valves from Locality **355e**, Upper Cambrian sandstone, Black Hills, South Dakota. U. S. Nat. Mus. Cat. Nos. 51924a and 51924b, respectively.

2b. Partly exfoliated ventral valve from Locality **167**, Middle Cambrian sandstone 9 miles west of Custer, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 51919a.

2c. Partly exfoliated dorsal valve associated with the shells represented by figures 2 and 2a. U. S. Nat. Mus. Cat. No. 51924c.

2d, 2e, and 2f. Partly exfoliated dorsal valves associated with the shell represented by figure 2b. U. S. Nat. Mus. Cat. Nos. 51919b, 51919c, and 51919d, respectively.

2g. Exterior of a ventral valve from Locality **355**, Middle Cambrian sandstones on Red Canyon Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 24593a. Specimen figured by Whitfield [1880, Pl. II, fig. 13] as *Obolella polita*. The specimen represented by figure 12 of Whitfield's paper is not figured in this monograph.

2h. Ventral valve from Locality **355e**, Upper Cambrian sandstone, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 1027a. Specimen figured by Meek and Hayden [1865, Pl. I, figs. 2a–b] as *Lingulepis prima*.

2i. Dorsal valve associated with the ventral valve represented by figure 2h. U. S. Nat. Mus. Cat. No. 1027b.

3. Partly exfoliated dorsal valve, from Locality **302k**, Middle Cambrian limestones, near Gallatin, Montana. U. S. Nat. Mus. Cat. No. 51923a.

4. Ventral valve, broadened by distortion and partly exfoliated. U. S. Nat. Mus. Cat. No. 51913a.

4a. Dorsal valve, broadened by distortion. U. S. Nat. Mus. Cat. No. 51913b.

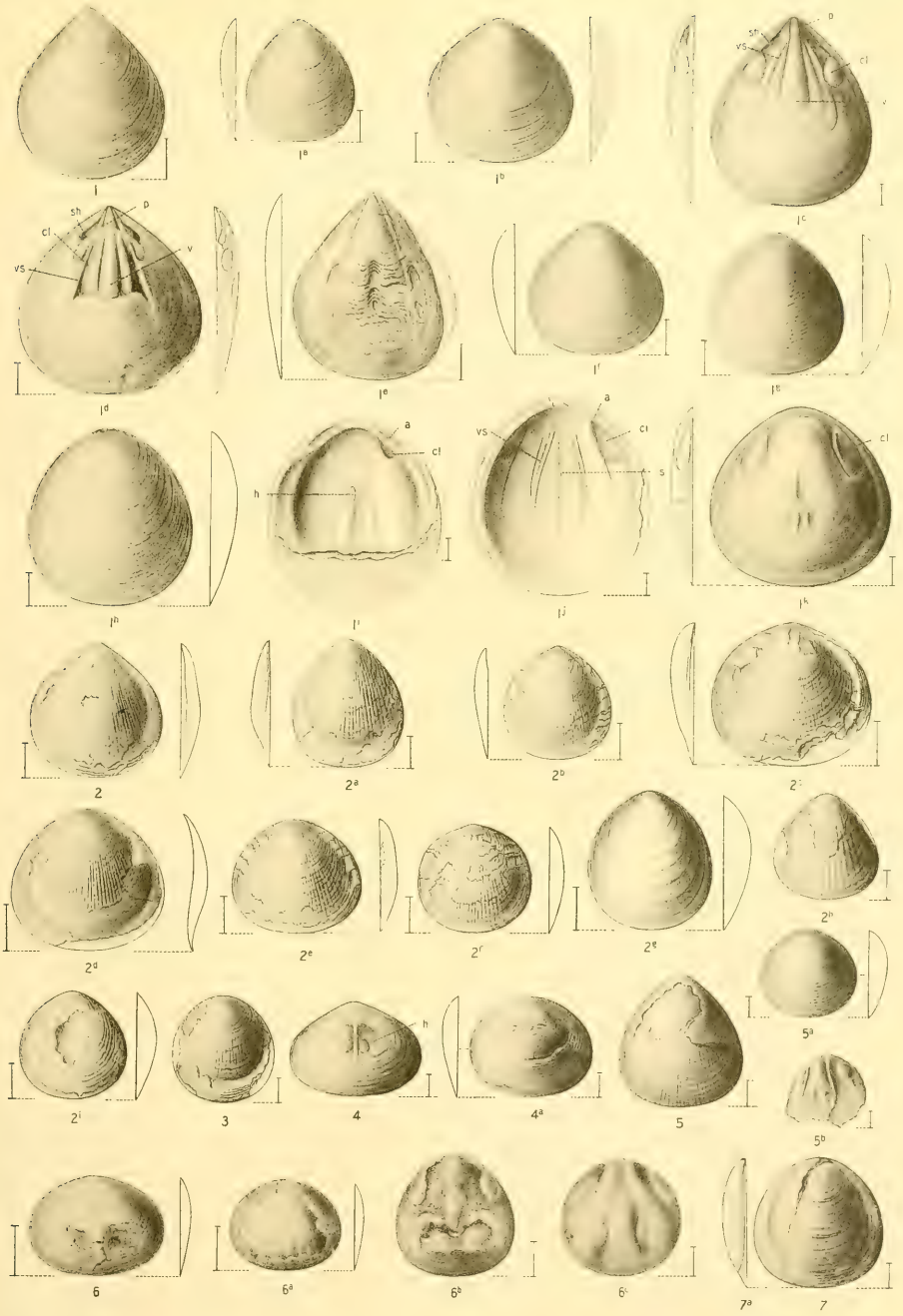
The specimens represented by figures 4 and 4a are both from Locality **302s**, Middle Cambrian shale 1.5 miles south of Helena, Montana. They are somewhat doubtfully referred to this species.

FIGURE 5. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51921a.

5a. Exterior view and side outline of dorsal valve. U. S. Nat. Mus. Cat. No. 51921b.

5b. Fragment of cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51921c.

The specimens represented by figures 5, 5a–b are all from Locality **329b**, Middle Cambrian limestone, collected by the Wheeler Survey in Utah.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

DICELLOMUS PECTENOIDES (Whitfield) (p. 575)

[Text figs. 48A–B, p. 575.]

FIGURE 6. A transverse, partly exfoliated ventral valve from Locality **355b**, Middle Cambrian sandstone on Castle Creek, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 24592a. Specimen figured by Whitfield [1880, Pl. II, fig. 18] as *Obolus? pectenoides*. This may be the type specimen, but it can not be identified with any of Whitfield's figures [1875, unnumbered plate, figs. 1–3].

6a. Partly exfoliated dorsal valve associated with the shell represented by figure 6. U. S. Nat. Mus. Cat. No. 24592b. Specimen figured by Whitfield [1880, Pl. II, fig. 19] as *Obolus? pectenoides*.

6b. Cast of interior of a ventral valve from Locality **164**, Middle Cambrian sandstone near Deadwood, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 51911a.

6c. Cast of interior of a dorsal valve associated with the shell represented by figure 6b. U. S. Nat. Mus. Cat. No. 51911b.

DICELLOMUS sp. undt. Walcott (p. 578).

FIGURES 7 and 7a. Exterior and side views of a dorsal valve, from Locality **3101**, Middle Cambrian at Andrarum, Province of Christianstad, Sweden. U. S. Nat. Mus. Cat. No. 58304.

PLATE LIII.

PLATE LIII.

c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
cl. Cardinal scars.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle furrow.
v. Visceral area.
vs. Vascular sinus.

Dicellomus nanus (Meek and Hayden) (p. 573).

Figures 1 and 1a. Exterior and side views of ventral valves varying in outline. U. S. Nat. Mus. Cat. Nos. 51903m and 51903a, respectively.

1b. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51903b.

1c. Natural cast of an interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51903c.

1d. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51903d.

1e. Natural cast of an interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51903e.

1f. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51903f.

1g and 1h. Exterior and side views of dorsal valves varying in outline. U. S. Nat. Mus. Cat. Nos. 51903g and 51903h, respectively.

1i. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51903i.

1j. Natural cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51903j.

1k. Natural cast of interior of a dorsal valve with large cardinal scars. U. S. Nat. Mus. Cat. No. 51903k.

1l. Interior of a dorsal valve showing area. U. S. Nat. Mus. Cat. No. 51903 l.

The specimens represented by figures 1, 1a–l are from Locality **170**, Middle Cambrian limestone about 10 miles south-southeast of Bald Mountain, Bighorn Mountains, Wyoming.

Figure 2. Interior of a ventral valve from Locality **355d**, Upper Cambrian sandstone, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 1025a. Type specimen, figured by Hayden [1862, fig. 2b, p. 73] as *Obolella nana*, and by Walcott [1899, Pl. LX, fig. 3d] as *Dicellomus nanus*.

2a. Partly exfoliated dorsal valve associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. No. 1025b. Specimen figured by Hayden [1862, fig. 2a, p. 73] as *Obolella nana*, and by Walcott [1899, Pl. LX, fig. 3b] as *Dicellomus nanus*.

3. Exfoliated ventral valve from Locality **152a**, Upper Cambrian sandstone on Dry Creek, Gallatin County, Montana. U. S. Nat. Mus. Cat. No. 51908a.

3a. Natural cast of an interior of a ventral valve from Locality **170**, Middle Cambrian limestone 10 miles south-southeast of Bald Mountain, Bighorn Mountains, Wyoming. U. S. Nat. Mus. Cat. No. 51903n.

3b. Dorsal valve associated with the shell represented by figure 3a. U. S. Nat. Mus. Cat. No. 51903o.

3c and 3d. Exteriors of dorsal valves associated with the shells represented by figure 3. U. S. Nat. Mus. Cat. Nos. 51908b and 51908c, respectively.

Dicellomus appalachia Walcott (p. 572).

Figure 4. Exterior of a ventral valve from Locality **119**, Middle Cambrian limestone collected somewhere in either Jefferson or Hawkins County, Tennessee. U. S. Nat. Mus. Cat. No. 51926a.

4a. Cast of interior of a ventral valve, the type specimen, from Locality **89**, Middle Cambrian limestone in Murphrees Valley, Blount County, Alabama. U. S. Nat. Mus. Cat. No. 51928a.

4b. Exterior of a ventral valve from Locality **90a**, Middle Cambrian shales at Cedar Bluff, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 51939a.

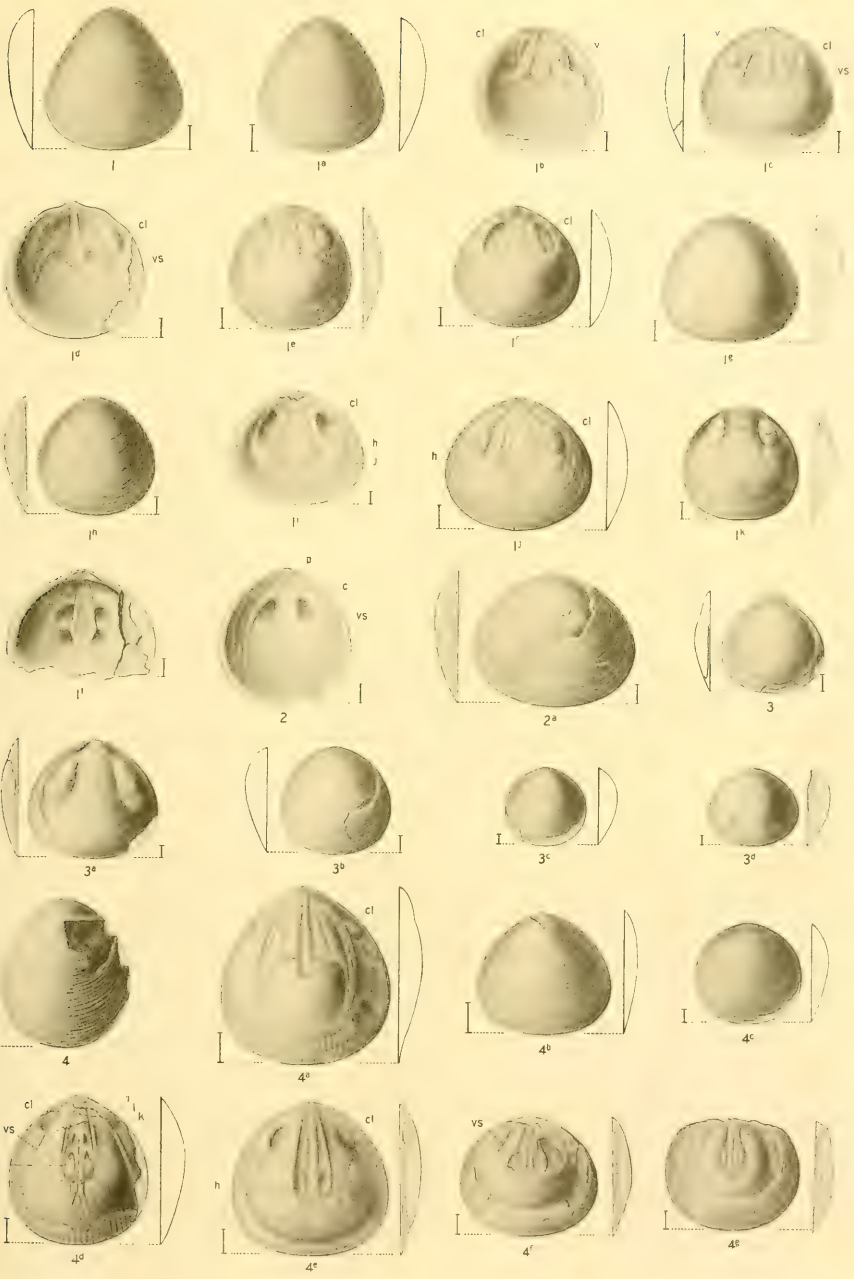
4c. Dorsal valve from Locality **16**, Middle Cambrian limestone in Blountsville Valley, Blount County, Alabama. U. S. Nat. Mus. Cat. No. 51937a.

4d. Partly exfoliated dorsal valve associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 51926b.

4e. Partly exfoliated dorsal valve, associated with the shell represented by figure 4a, showing visceral area, muscle scars, etc. U. S. Nat. Mus. Cat. No. 51928b.

4f. Partly exfoliated dorsal valve, from Locality **91**, Middle Cambrian shales at Cedar Bluff, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 51936a.

4g. Partly exfoliated dorsal valve from Locality **103a**, Middle Cambrian shale on the road from Rogersville to Dodson Ford, Hawkins County, Tennessee. U. S. Nat. Mus. Cat. No. 51938a.



FRANCES WIESER DEL.

HELIOTYPE CO., BOSTON.

PLATE LIV.

PLATE LIV.

a. Central lateral space of area.
a'. Outer lateral space of area.
c. Trapezoidal area, including central, middle lateral, and outside lateral muscle scars.
f. Flexure line of area.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle groove.
pc. Cast of pedicle opening.
v. Visceral cavity.
vs. Main vascular sinus.

Obolella chromatica Billings (p. 591).

Figure 1. Ventral valve of the usual form and outline. U. S. Nat. Mus. Cat. No. 14891a.

1a. Posterior view of the specimen represented by figure 1b, showing area and narrow pedicle slit. U. S. Nat. Mus. Cat. No. 14891b.

1b and 1c. Outer and side view of a ventral valve that is less elongate than specimen represented by figure 1 (see fig. 1a). U. S. Nat. Mus. Cat. No. 14891b.

1d. Dorsal valve, in which the structure of the shell is unusually well preserved. U. S. Nat. Mus. Cat. No. 14891c.

1e. Cast in limestone of the interior of a ventral valve, showing vascular markings and muscle scars. The extreme posterior portion is, unfortunately, broken away. The false pedicle furrow is too deep and strong. It is shallow in the specimen. U. S. Nat. Mus. Cat. No. 14891d.

1f. Interior of a ventral valve that has a narrow thickening of the shell just in front of the area, corresponding to the posterior portion of the thickened shell usually present in the ventral valve of *Obolella crassa* beneath the visceral area. (See figs. 2g and 2i.) Geol. Survey Canada.

1g. Cast in limestone of the interior of a small dorsal valve. U. S. Nat. Mus. Cat. No. 14891e.

1h. Interior of a dorsal valve. The area is outlined from a specimen in the collection of the Geological Survey of Canada. U. S. Nat. Mus. Cat. No. 14891f. Specimen figured by Walcott [1886b, Pl. XI, fig. 1b]. The specimens represented by figures 1 and 1a [Walcott, 1886b, Pl. XI] are not redrawn in this monograph.

1i. Interior of a dorsal valve drawn from a plaster cast of a limestone cast in the collection of the Geological Survey of Canada; cast in the United States National Museum (Cat. No. 14891g). Cast figured by Walcott [1886b, Pl. X, fig. 3]; and [1891a, Pl. LXXI, fig. 3] as *Obolella circe*.

The specimens represented by figures 1, 1a–i are all from Locality **392a**, Lower Cambrian limestone at L'Anse au Loup, Straits of Belleisle, Labrador. The material in the collections of the Geological Survey of Canada includes the specimens upon which Billings founded the species, but closer identification is impossible.

Obolella crassa (Hall) (p. 592).

[Text fig. 14, p. 299.]

Figure 2. Exterior of a ventral valve of the usual form and outline from Locality **27**, Lower Cambrian limestone in the eastern suburb of Troy, New York. U. S. Nat. Mus. Cat. No. 15348a.

2a. An unusually elongate ventral valve, with the surface characters well preserved, from Locality **2b**, Lower Cambrian limestone just north of Beman Park, Troy, New York. U. S. Nat. Mus. Cat. No. 51951a.

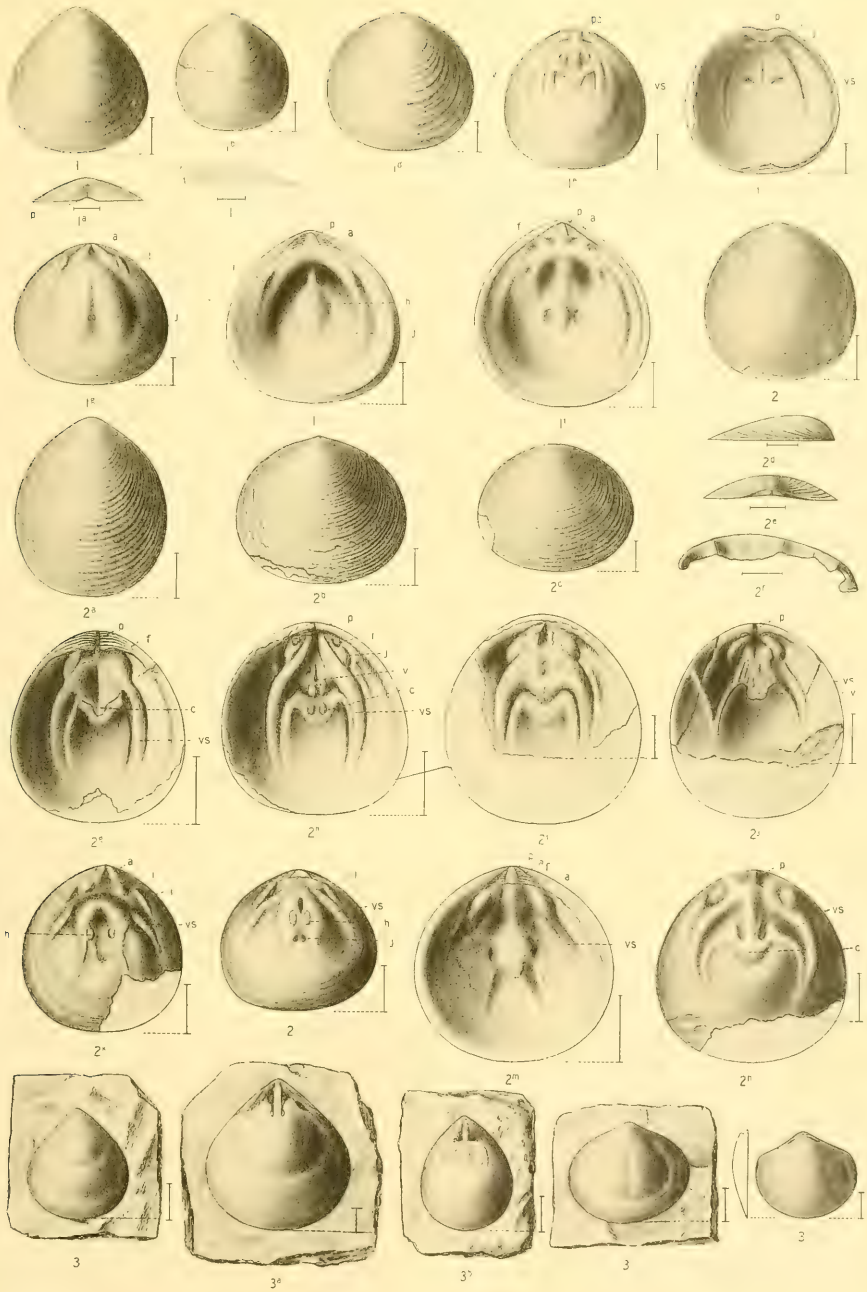
2b. An unusually broad ventral valve associated with the shell represented by figure 2a. U. S. Nat. Mus. Cat. No. 51951b.

2c and 2d. Exterior and side views of a dorsal valve, associated with the shell represented by figure 2a. U. S. Nat. Mus. Cat. No. 51951c.

2e. Posterior view of a ventral valve associated with the shell represented by figure 2a, showing low area and the pedicle slit. U. S. Nat. Mus. Cat. No. 51951d.

2f. Section of a ventral valve associated with the shell represented by figure 2a, naturally broken near the median line. The thickest part of the shell is over the visceral area. U. S. Nat. Mus. Cat. No. 51951e.

2g, 2h, and 2i. Interiors of ventral valves illustrating variation in the areas, vascular markings, and muscle scars. Note the narrow rounded area and the shallow median furrow in figure 2h; the inner end of the pedicle tube is shown on the specimen just beneath the inner edge of the area. Locality **2b**, Lower Cambrian limestone just north of Beman Park, Troy, New York. U. S. Nat. Mus. Cat. Nos. 51951f, 51951g, and 51951h, respectively.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

OBOLELLA CRASSA (Hall)—Continued.

FIGURE 2j. Interior of ventral valve from Locality 29a, Lower Cambrian limestone at Schodack, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 51952a.

2k. Interior of a dorsal valve associated with the specimen represented by figure 2a. U. S. Nat. Mus. Cat. No. 51951i.

2 l. Cast in limestone of the interior of a dorsal valve from Locality 27, Lower Cambrian limestone in the eastern suburb of Troy, New York. The exact position of the anterior lateral muscle scars in figure 2 l is more or less uncertain and the line from (i) indicating the transmedian scar should unite with that from (l) as in figure 2 l. U. S. Nat. Mus. Cat. No. 15347a. Specimen figured by Walcott [1886b, Pl. X, fig. 1c]. The other specimens illustrated [Walcott, 1886b] are not redrawn in this monograph.

2m. Interior of a dorsal valve associated with the specimen represented by figure 2a. The other specimens were used to draw in the details of the area. U. S. Nat. Mus. Cat. No. 51951j.

2n. Cast of the interior of a ventral valve associated with the shell represented by figure 2a. U. S. Nat. Mus. Cat. No. 51951k.

OBOLELLA MINOR (Walcott) (p. 596).

FIGURE 3. Exterior of a ventral valve. U. S. Nat. Mus. Cat. No. 24628c.

3a. Cast of the interior of a ventral valve, the type specimen, showing area and cast of pedicle groove. U. S. Nat. Mus. Cat. No. 24628a.

3b. Cast of interior of ventral valve. U. S. Nat. Mus. Cat. No. 24628d.

3c. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 24628b.

3d. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 24628e.

The specimens represented are all from Locality 32, Lower Cambrian sandstone, Stissing Mountain, Dutchess County, New York. The figures (3, 3a–d) are copied from Walcott [1891a, Pl. LXXII, figs. 4a, 4d, 4, 4b, and 4c, respectively]. They were then labeled "*Camarella? minor.*"

PLATE LV.

PLATE LV.

a. Central lateral space of area.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
l. Outside lateral scar.
p. Pedicle groove.
pc. Cast of pedicle opening.
s. Median septum.
v. Visceral cavity.
vs. Main vascular sinus.
x. Heart-shaped cavity

Obolella atlantica Walcott (p. 589).

[Text fig. 51, p. 590.]

Figure 1. Exterior of an unusually convex, elongate ventral valve. Locality **5o**, Lower Cambrian siliceous shale, Smith Sound, Trinity Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51948a.

1a. Cast in siliceous shale of the exterior of a ventral valve, showing surface characters of the shell. Same locality as specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 51948b.

1b. Exterior of a small ventral? valve. Locality **41a**, Lower Cambrian limestone beneath Topsail Head, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 56957a.

1c. Exterior of small dorsal valve, associated with specimen represented by figure 1b. U. S. Nat. Mus. Cat. No. 56957b.

1d. A slightly distorted dorsal valve from Locality **5o**, Lower Cambrian siliceous shale, Smith Sound, Newfoundland. U. S. Nat. Mus. Cat. No. 51948c.

1e. Interior of a ventral valve associated with the shell represented by figure 1d. The pedicle furrow is too strong in the figure. On the specimen it is indicated by a slightly depressed line on each side of what is usually the pedicle furrow. This specimen is also figured in a slightly different position in text figure 51, p. 590. U. S. Nat. Mus. Cat. No. 51948d.

1f and 1g. Casts of the interior of ventral valves associated with the shell represented by figure 1d. U. S. Nat. Mus. Cat. Nos. 51948e and 51948f, respectively.

1h. Top and side view of cast of the interior of a ventral valve, the type specimen, from Locality **41**, Lower Cambrian decomposed limestone, from Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 18322a.

1i. Cast of the interior of a dorsal valve, associated with specimen represented by figure 1h. U. S. Nat. Mus. Cat. No. 18322b.

Obolella (Glyptias) favosa (Linnarsson) (p. 600).

Figure 2. Exterior and side view of ventral valve. U. S. Nat. Mus. Cat. No. 35264a.

2a. Exterior and side view of dorsal valve. U. S. Nat. Mus. Cat. No. 35264b.

2b. Cast of the interior of ventral valve that retains a portion of the shell. U. S. Nat. Mus. Cat. No. 35264c.

2c. Cast of the interior of small dorsal valve. U. S. Nat. Mus. Cat. No. 35264d.

2d. Outer surface of shell greatly enlarged. U. S. Nat. Mus. Cat. No. 35264e.

The specimens represented by figures 2, 2a–d are from Locality **309c**, Lower Cambrian sandstone at Billingen, Province of Skaraborg, Sweden.

Obolella mobergi Walcott (p. 597).

Figures 3 and 3a. Exterior and side view of ventral valve, drawn from a cast taken in a natural mold in sandstone. Original in the collection of the Geological Museum, Lund, Sweden; cast in the United States National Museum (Cat. No. 35261a).

3b. Posterior view of specimen represented by figure 3, showing area and cast of pedicle slit.

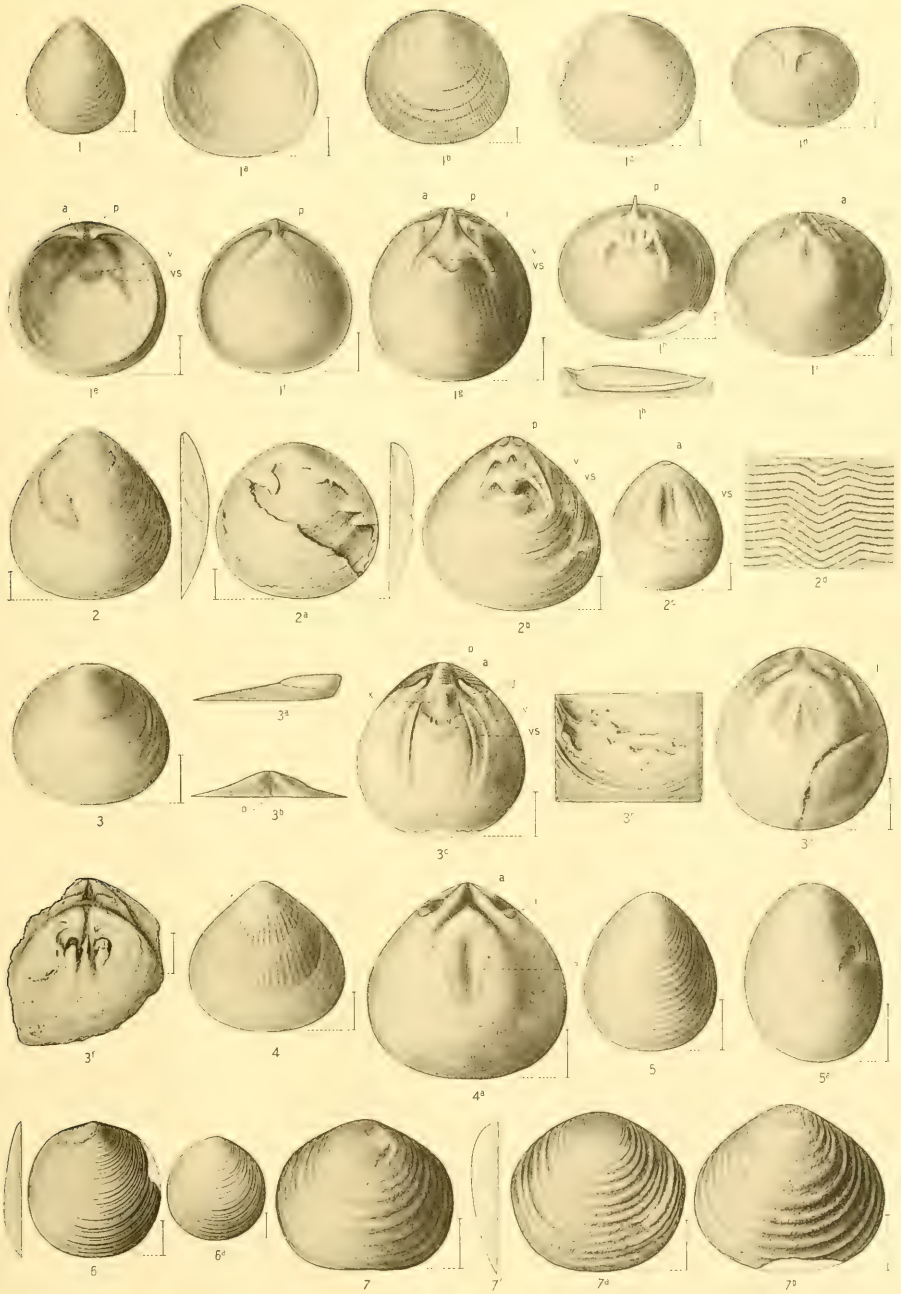
3c. Cast in fine sandstone of interior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35261b.

3d. Enlargement of a natural cast of a portion of the outer surface. U. S. Nat. Mus. Cat. No. 35261c.

3e. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35261d.

3f. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35261e.

The specimens represented are all from Locality **321s**, Lower Cambrian sandstone at Sularp, near Lund, Province of Malmöhus, Sweden.



FRANCES WIESER DEL.

Obolella? lindströmi Walcott (p. 596).

Figure 4. Exterior of a ventral valve, the type specimen, from Locality **321v**, Lower Cambrian sandstone at Björkelunda, Province of Christianstad, Sweden. The specimen from which this figure was drawn can not be located. A record of the locality was, however, preserved.

4a. Cast of the interior of dorsal valve, from Locality **321s**, Lower Cambrian sandstone at Sularp, near Lund, Province of Malmöhus, Sweden. U. S. Nat. Mus. Cat. No. 35263a.

Obolella crassa elongata Walcott (p. 595).

Figure 5. Ventral valve, the type specimen from Locality **319b**, Lower Cambrian limestone at St. Simon, Quebec, Canada. U. S. Nat. Mus. Cat. No. 14691a.

5a. Dorsal valve associated with specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 14691b.

Obolella asiatica Walcott (p. 588).

Figure 6. Exterior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52525a.

6a. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52525b.

The specimens represented are both from Locality **C32′**, Lower Cambrian limestone bowlder 1 mile south of Chonpinghien, on Nankiang River, Shensi, China.

Obolella wirrialpensis Etheridge (p. 599).

Figures 7 and 7′. Top and side views of ventral valve. University of Adelaide, South Australia.

7a. Exterior of dorsal valve marked by strong concentric ridges. U. S. Nat. Mus. Cat. No. 51963a.

7b. Dorsal valve. University of Adelaide, South Australia. Type specimen, figured by Etheridge [1905, Pl. XXV, fig. 2].

The specimens represented by figures 7, 7a-b are all from Locality **315d**, Lower? Cambrian limestone near Wirrialpa, Flinders Range, South Australia.

PLATE LVI.

PLATE LVI.

cl. Cardinal scars.
F′. Cast of foraminal tube.
fa. False area.
j. Anterior lateral muscle scar.
s. Median septum.
v. Visceral area.
vs. Vascular sinuses.
x′. Cast of visceral cavity.

Acrothele coriacea Linnarsson (p. 642).

Figure 1. Top and back view of ventral valve from Locality **334f**, Middle Cambrian limestone on Bornholm Island, Denmark. U. S. Nat. Mus. Cat. No. 51983a.

1a. Interior of a ventral valve from Locality **320f**, Middle Cambrian limestone at Andrarum, Province of Christianstad, Sweden. U. S. Nat. Mus. Cat. No. 18208a.

1b. Cast of interior of a ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 18208b.

1c. Cast of interior of a ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 18208e.

1d and 1e. Interiors of dorsal valves associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. Nos. 18208c and 18208d, respectively.

1f. Cast of interior of a dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 18208f.

1g. Enlargement of the surface of a specimen associated with the shell represented by figure 1. U. S. Nat. Mus. Cat. No. 51983b.

1h and 1h′. Top and side views of a small ventral valve from Locality **8w**, Middle Cambrian limestones at Andrarum, Province of Christianstad, Sweden, showing the small node on each side of the apex. U. S. Nat. Mus. Cat. No. 51978a.

1i. Top and back view of a very small ventral valve associated with the shell represented by figure 1h, showing a central posterior node, and a small node on each side of the apex. U. S. Nat. Mus. Cat. No. 51978b.

Acrothele (Redlichella) granulata (Linnarsson) (p. 663).

Figure 2. Top and side views of exterior of a ventral valve from Locality **8z**, Middle Cambrian limestones of the *Paradoxides œlandicus* zone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 51991a.

2a. Interior of a ventral valve from Locality **310o**, Middle Cambrian limestones of the *Paradoxides tessini* zone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 56643a.

2b. Cast of the interior of a ventral valve from Locality **309f**, Middle Cambrian shale at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 23897a.

2c. Interior of a ventral valve associated with the shell represented by figure 2, showing visceral area. U. S. Nat. Mus. Cat. No. 51991b.

2d. Top and side views of exterior of a dorsal valve associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. No. 51991c.

2e. Interior of a dorsal valve associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. No. 51991d.

2f. Exterior of a dorsal valve associated with the shell represented by figure 2b, showing elongate tubercles at the apex. U. S. Nat. Mus. Cat. No. 23897b.

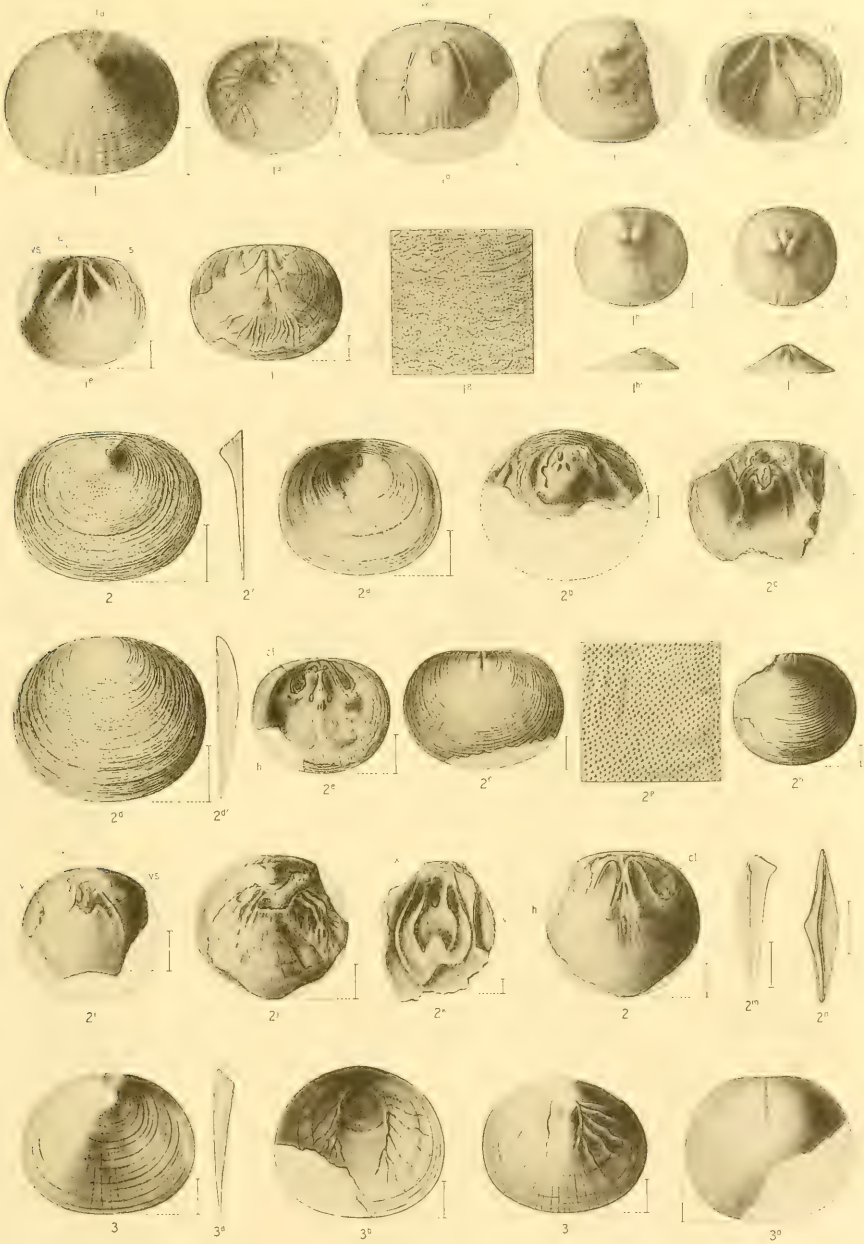
2g. Enlargement of the surface of the specimen represented by figure 2f. U. S. Nat. Mus. Cat. No. 23897b.

2h. Exterior of a dorsal valve from Locality **320b**, Middle Cambrian limestones at Gudhem, Province of Skaraborg, Sweden. U. S. Nat. Mus. Cat. No. 51992a.

2i. Cast of an interior of a ventral valve associated with the dorsal valve represented by figure 2h, showing the cast of the visceral area (v), the expanded interior opening of the foraminal tube (F′), and main vascular sinuses (vs). U. S. Nat. Mus. Cat. No. 51992b.

2j. Partly exfoliated ventral valve from Locality **309f**, Middle Cambrian shale at Borgholm, Oeland Island, Sweden, showing the main vascular sinuses and branches. U. S. Nat. Mus. Cat. No. 23897c.

2k. Fragment of the interior of a ventral valve associated with the shells represented by figures 2h and 2i, greatly enlarged so as to show the outline of the visceral area. U. S. Nat. Mus. Cat. No. 51992c.



FRANCES WIESER DEL.

ACROTHELE (REDLICHELLA) GRANULATA (Linnarsson)—Continued.

FIGURE 21. Cast of the interior of a dorsal valve associated with the specimen represented by figure 2j. U. S. Nat. Mus. Cat. No. 23897d.

2m and 2n. Side and posterior views of a shell in which the two valves are united, associated with the shell represented by figure 2. U. S. Nat. Mus. Cat. No. 51991e.

ACROTHELE INTERMEDIA Linnarsson (p. 646).

FIGURES 3 and 3a. Ventral valve, the type specimen, with side outline, ×4. Copied from Linnarsson [1879, Pl. III, figs. 40 and 41].

3b. Interior of a ventral valve, showing main vascular canals and branches, ×4. Copied from Linnarsson [1879, Pl. III, fig. 43].

3c. Cast of the interior of a ventral valve. Copied from Linnarsson [1879, Pl. III, fig. 42].

3d. Cast of the interior of a broken dorsal valve. Copied from Linnarsson [1879, Pl. III, fig. 44].

The specimens represented by figures 3, 3a–c are from Locality **320k**, Middle Cambrian limestones of the *Coronatus* zone at Kiviks Esperöd, Province of Malmöhus; the specimen represented by figure 3d is from Locality **320i**, the same horizon, at Andrarum, Province of Christianstad; both in Sweden.

PLATE LVII.

PLATE LVII.

cl. Cardinal scars.
F. Foramen.
F′. Cast of pedicle tube.
s. Median septum.
v. Visceral area.
vs. Vascular sinus.

Acrothele bohemica (Barrande) (p. 639).

Figures 1 and 1′. Top and side views of ventral valve, the type specimen, from Locality **345c**, Middle Cambrian shales at Mleschitz, Bohemia. Copied from Barrande [1879b, Pl. CII, figs. VII: 1A and 1B], where they are labeled *Obolus? bohemicus*.

1a and 1a′. Top and side views of a dorsal valve associated with the ventral valve represented by figure 1. Copied from Barrande [1879b, Pl. CII, figs. VII: 2A and 2B], where they are labeled *Obolus? bohemicus*.

1b. Ventral valve from Locality **345**, Middle Cambrian shales on the Dlouhá Hora, above the brook of Sbirov, near Skrej, Bohemia. Copied from Pompeckj [1896b, Pl. XIV, fig. 8b].

1c. Dorsal valve from the locality represented by figure 1b. Copied from Pompeckj [1896b, Pl. XIV, fig. 11b].

1d. Interior of dorsal valve from the locality represented by figure 1b. Copied from Pompeckj [1896b, Pl. XIV, fig. 10b].

Acrothele maculata (Salter) (p. 647).

[Pl. LVIII, fig. 2.]

Figure 2. Exterior of dorsal valve.

2a. Exterior of dorsal valve.

2b. Cast of the interior of a dorsal valve, the type specimen.

Figures 2, 2a–b are copied from Davidson [1868, Pl. XVI, figs. 1–3]; the same figures being copied by Davidson in his later work [1871, Pl. L, figs. 18, 19, and 21]. Davidson states that the specimens are from Porth-y-rhaw, St. Davids, and from Gwynfynydd and Camlan, North Wales.

Acrothele bellapunctata Walcott (p. 636).

Figure 3. Exterior of partly exfoliated ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51972a. Copied from Walcott [1908d, Pl. VIII, fig. 9].

3a. Exterior of partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 51972b.

3b. Surface of outer layer enlarged 15 diameters. U. S. Nat. Mus. Cat. No. 51972c. A portion of the surface represented by figure 3b was illustrated by Walcott [1908d, Pl. VIII, fig. 9′] as the surface of the specimen represented by figure 3; it is, however, taken from another specimen.

The specimens represented are all from Locality **8v**, Lower Cambrian shales at Ringsaker, near Lake Mjösen, Province of Hedemarken, Norway.

Botsfordia granulata (Redlich) (p. 605).

Figure 4. Cast of exterior of an almost perfect specimen of the transversely oval form of the ventral valve. U. S. Nat. Mus. Cat. No. 52046s.

4a. Exterior of a longitudinally elongate oval form of the ventral valve. U. S. Nat. Mus. Cat. No. 52046a.

4b. Exterior of a transversely oval dorsal valve, preserving the two small sharp tubercles at the apex. U. S. Nat. Mus. Cat. No. 52046b.

4c. Posterior portion of a ventral valve, showing the pedicle aperture. U. S. Nat. Mus. Cat. No. 52046c.

4d. Posterior portion of a ventral valve, showing a crescentiform tubercle on each side of and a small tubercle just back of the depression at the apex; the pedicle aperture is just back of the posterior tubercle and in fact appears to come up through it. U. S. Nat. Mus. Cat. No. 52046d.

4e. Exterior view of elongate form of dorsal valve. U. S. Nat. Mus. Cat. No. 52046e.

4f and 4f′. Exterior and side view of a ventral valve intermediate in outline between the specimens represented by figures 4 and 4a. U. S. Nat. Mus. Cat. No. 52046f.

4g. Cast of interior of ventral valve. U. S. Nat. Mus. Cat. No. 52046g.

FRANCES WIESER DEL.

Botsfordia granulata (Redlich)—Continued.

Figure 4h. Partly exfoliated ventral valve, showing the impression of the main vascular sinuses on the inner layers of the shell. U. S. Nat. Mus. Cat. No. 52046h.

4i. Cast of interior of a small ventral valve. U. S. Nat. Mus. Cat. No. 52046i.

4j. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52046j.

4k. Interior of a small dorsal valve. U. S. Nat. Mus. Cat. No. 52046k.

4l. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52046 l.

4m. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52046m.

4n and 4o. Exteriors of dorsal valves, showing variation in outline, as compared with figure 4b, and in small tubercles near the apex. U. S. Nat. Mus. Cat. Nos. 52046n and 52046o, respectively.

4p. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52046p.

4q. Exterior of one of the largest ventral valves. U. S. Nat. Mus. Cat. No. 52046q.

4r. Enlargement of surface to show granulations. U. S. Nat. Mus. Cat. No. 52046r.

The specimens represented are all from Locality **15r**, Middle Cambrian shale at Khussak, Salt Range, India.

Acrothele quadrilineata Pompeckj (p. 655).

Figure 5. Top and side views of the type specimen, a ventral valve, from Locality **345d**, Middle Cambrian shales at Skrej, Bohemia. Copied from Pompeckj [1896b, Pl. XIV, figs. 6b and 6c].

Acrothele primæva (de Verneuil and Barrande) (p. 654).

Figures 6 and 6′. Top and side views of the type specimen, a ventral valve, from Locality **350**, Middle Cambrian limestone near Adrados, Cantabrian Mountains, Province of Leon, Spain. Copied from de Verneuil and Barrande's figures [1860, Pl. VIII, figs. 2 and 2a] of *Discina (Orbicula) primæva.*

Botsfordia? barrandei Walcott (p. 602).

Figure 7. Dorsal view of the type specimen, showing apex of ventral valve, from Locality **350**, Middle Cambrian limestone near Adrados, Cantabrian Mountains, Province of Leon, Spain.

7a and 7b. Posterior and side views of the specimen represented by figure 7.

Figures 7, 7a–b are copied from de Verneuil and Barrande's figures [1860, Pl. VIII, figs. 5, 5a–b] of "Brachiopode, nouv. gen."

PLATE LVIII.

PLATE LVIII.

cl. Cardinal scars.
F. Foramen.
F'. Cast of foraminal tube.
fa. False area.
h. Central muscle scar.
s. Median septum.
v. Visceral area.
vs. Vascular sinuses.

Acrothele pretiosa (Billings) (p. 652).

Figures 1 and 1a. Exteriors of crushed and slightly distorted ventral valves. U. S. Nat. Mus. Cat. Nos. 52004a and 52004b, respectively.

1b. Partly exfoliated and compressed ventral valve. U. S. Nat. Mus. Cat. No. 52004c.

1c. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52004d.

1d. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52004e.

1e. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52004f.

1f. Cast of interior of a dorsal valve, showing median septum extending well toward the front margin. U. S. Nat. Mus. Cat. No. 52004g.

1g. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52004h.

The specimens represented are all from Locality **220a**, Ordovician shales at the Grand Trunk railroad bridge over Chaudiere River, Quebec, Canada.

Acrothele maculata (Salter) (p. 647).

[Pl. LVII, figs. 2, 2a-b.]

Figure 2. Exterior of distorted and compressed ventral valve from Locality **318h**, Middle Cambrian Menevian shales of St. Davids, South Wales. U. S. Nat. Mus. Cat. No. 51993a.

Acrothele decipiens Walcott (p. 644).

Figure 3. Exterior of ventral valve with side and transverse outline. U. S. Nat. Mus. Cat. No. 26435b.

3a. Partly exfoliated ventral valve, the type specimen, with the rim of the foraminal aperture broken off. U. S. Nat. Mus. Cat. No. 26435a. Specimen figured by Walcott [1897b, Pl. LX, fig. 2].

3b. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 26435c.

3c. Interior of a compressed dorsal valve. U. S. Nat. Mus. Cat. No. 26435d.

3d. Cast of an interior of a distorted dorsal valve. U. S. Nat. Mus. Cat. No. 26435e.

The specimens represented are all from Locality **50**, Lower Cambrian shale, 1.125 miles north of Stoner, York County, Pennsylvania.

Acrothele nitida (Ford) (p. 650).

Figure 4. Exterior of the type specimen, a dorsal valve, from Locality **27**, Lower Cambrian limestone in the eastern suburb of Troy, New York. U. S. Nat. Mus. Cat. No. 15353a. Specimen figured [Walcott, 1886b, Pl. XI, fig. 2] as *Obolella nitida*.

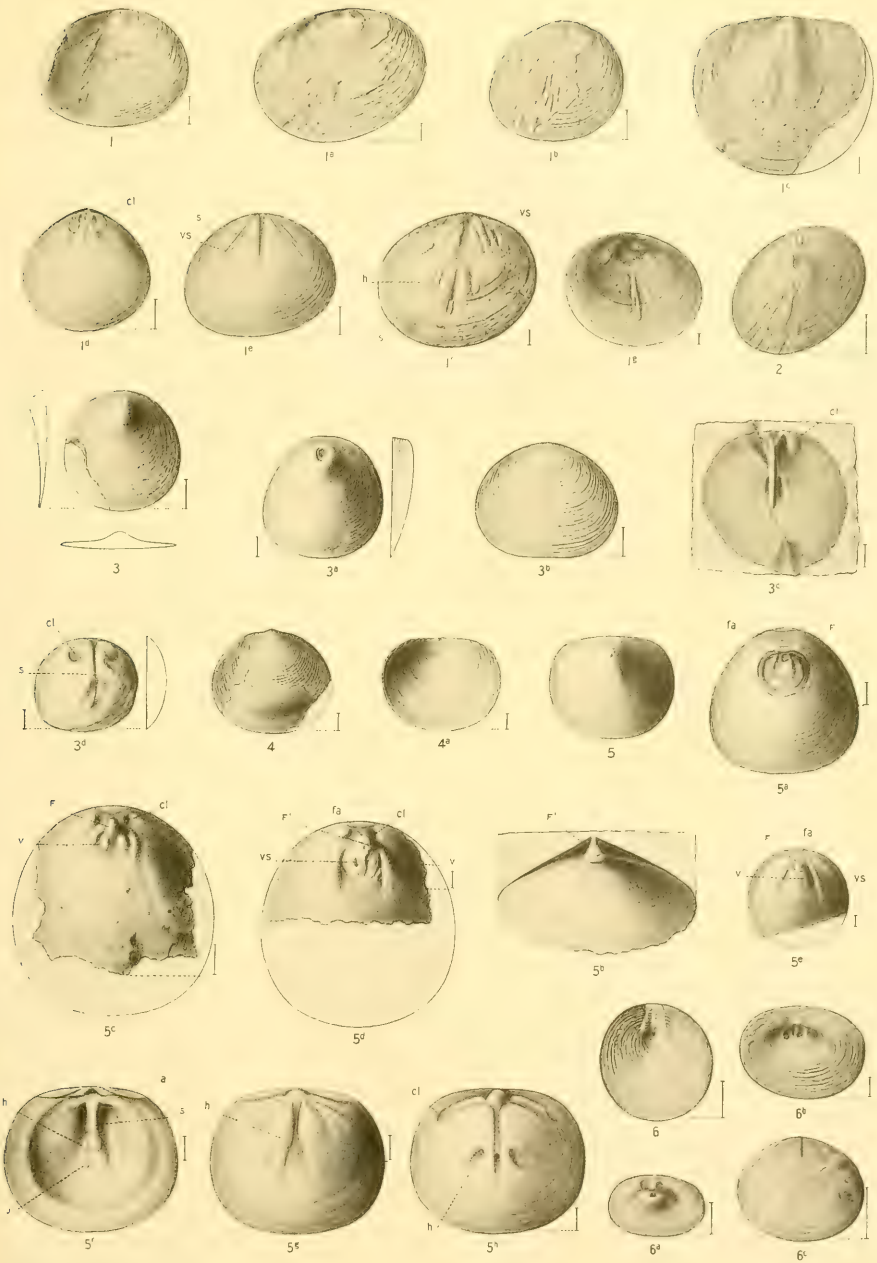
4a. Interior of dorsal valve associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 15353b.

Acrothele bellula Walcott (p. 637).

Figure 5. Exterior of a small ventral valve, the type specimen, from Locality **90x**, Middle Cambrian siliceous nodules in Coosa Valley, Cherokee County, Alabama. U. S. Nat. Mus. Cat. No. 26436a. Another specimen (Cat. No. 26436b) was used in restoring certain portions of this figure. Copied from Walcott [1897b, Pl. LX, fig. 4].

5a. Cast of the interior of a slightly distorted ventral valve from Locality **94x**, Middle Cambrian shale near Givens Mill, Cowan Creek, Cherokee County, Alabama. A portion of the shell is preserved near the apex. U. S. Nat. Mus. Cat. No. 56602a. Copied from Walcott [1897b, Pl. LX, fig. 4a].

5b. Natural cast of the foraminal tube of a specimen associated with the shell represented by figure 5. U. S. Nat. Mus. Cat. No. 26436c.



FRANCES WIESER DEL.

HELIOTYPE CO., BOSTON.

Acrothele bellula Walcott—Continued.

Figure 5c. Enlargement of the cast of the interior of a ventral valve associated with the shell represented by figure 5. U. S. Nat. Mus. Cat. No. 26436d. Copied from Walcott [1897b, Pl. LX, fig. 4b]. In this figure the line indicating the cardinal scar is extended a little too far. It should have stopped before reaching the depression.

5d. Cast of the posterior portion of the interior of a ventral valve associated with the shell represented by figure 5. U. S. Nat. Mus. Cat. No. 26436e. In this figure the line indicating the cardinal scar is extended a little too far. It should have stopped before reaching the depression.

5e. Cast of the interior of a small ventral valve associated with the shell represented by figure 5, showing vascular sinuses. U. S. Nat. Mus. Cat. No. 26436f.

5f. Interior of a dorsal valve drawn from a cast of the specimen represented by figure 5g, showing the area, median septum, and diverging vascular sinuses. U. S. Nat. Mus. Cat. No. 26436g. Another specimen (Cat. No. 26436h) was used in restoring certain portions of this figure and of figure 5g. Copied from Walcott [1897b, Pl. LX, fig. 4c].

5g. Natural cast of the interior of a dorsal valve from Locality **90x**, Middle Cambrian siliceous nodules, Coosa Valley, Cherokee County, Alabama. A cast of this specimen is represented by figure 5f. U. S. Nat. Mus. Cat. No. 26436g. Copied from Walcott [1897b, Pl. LX, fig. 4d].

5h. Cast in shale of the interior of a dorsal valve from Locality **94x**, Middle Cambrian shales near Givens Mill, Cowan Creek, Cherokee County, Alabama. The cardinal muscle scar is drawn too far away from the median line. It should be about the length of the scar from the median line. U. S. Nat. Mus. (Cat. No. 56602b. Copied from Walcott [1897b, Pl. LX, fig. 4e].

Acrothele bergeroni Walcott (p. 638).

Figures 6 and 6a. Exteriors of compressed and slightly distorted ventral valves. U. S. Nat. Mus. Cat. Nos. 51975b and 51975c, respectively.

6b. Cast of the interior of a compressed and distorted ventral valve. U. S. Nat. Mus. Cat. No. 51975d.

6c. Cast of the interior of a dorsal valve, the type specimen, flattened in the shale. U. S. Nat. Mus. Cat. No. 51975a. Copied from Walcott [1908d, Pl. VIII, fig. 11].

The specimens represented are all from Locality **342**, Middle Cambrian shales in Montagne Noire, Coulouma, Hérault, France.

PLATE LIX.

PLATE LIX.

a. Area.
cl. Cardinal scars.
F¹. Cast of foraminal tube.
s. Median septum.
v. Visceral area.
vs. Vascular sinus.

Botsfordia cælata (Hall) (p. 603).

[Pl. LIX, figs. 3, 3a-b.]

Figure 1. Partly exfoliated, broken ventral valve from Locality **2o**, Lower Cambrian limestone bowlders at entrance to Bic Harbor, Quebec, Canada. U. S. Nat. Mus. Cat. No. 35259a.

1a. Fragment of a large ventral valve from Locality **2b**, Lower Cambrian limestone north of Beman Park, near Troy, New York. U. S. Nat. Mus. Cat. No. 52040a.

1b. Top, side, and back views of a ventral valve associated with the shell represented by figure 1a, showing the foraminal aperture. U. S. Nat. Mus. Cat. No. 52040b.

1c. Broad form of ventral valve from Locality **27**, Lower Cambrian limestone in the eastern suburb of Troy, New York. U. S. Nat. Mus. Cat. No. 15325a. Specimen figured [Walcott, 1886b, Pl. VII, fig. 1b] as *Lingulella cælata*.

1d. Small ventral valve associated with the shell represented by figure 1. U. S. Nat. Mus. Cat. No. 35259b.

1e. Cast of part of the interior of a ventral valve from Locality **2p**, Lower Cambrian limestone a little west of Bic, Quebec, Canada. U. S. Nat. Mus. Cat. No. 56874a.

1f. Interior of a small ventral valve from Locality **35a**, Lower Cambrian limestone on Bald Mountain, Washington County, New York. U. S. Nat. Mus. Cat. No. 52037a.

1g. Fragment of the interior of a ventral valve from Locality **29a**, Lower Cambrian limestone at Schodack, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 15323a.

1h. Enlargement of a portion of the exterior surface of a ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 35259c.

1i. Partly exfoliated dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52040c.

1j. Posterior portion of a dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52040d.

1k. Cast of the posterior portion of the interior of a dorsal valve associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52040e.

1l. Partly exfoliated dorsal valve from Locality **35**, Lower Cambrian limestone 1.5 miles north of Bald Mountain, Washington County, New York. U. S. Nat. Mus. Cat. No. 17457a.

1m. Partly exfoliated dorsal valve associated with the specimen represented by figure 1a, showing cast of the median septum and main vascular sinuses. U. S. Nat. Mus. Cat. No. 52040f.

1n. Fragment of a cast of the interior of a dorsal valve. The true outline of this specimen and the locality are unknown. Am. Mus. Nat. Hist., New York.

1o. Enlargement of surface of a dorsal valve associated with the specimen represented by figure 1c. U. S. Nat. Mus. Cat. No. 15325b. Specimen figured [Walcott, 1886b, Pl. VII, fig. 1d] as *Lingulella cælata*.

1p and 1p′. Thin section of limestone containing many shells of the species from Locality **2b**, Lower Cambrian limestone north of Beman Park, Troy, New York. U. S. Nat. Mus. Cat. No. 52040g.

1q. Exfoliated ventral valve showing cast of pedicle opening and visceral cavity, from Locality **29a**, Lower Cambrian limestone at Schodack, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 15323b.

Mickwitzia monilifera (Linnarsson) (p. 330).

[Pl. VI, figs. 1, 1a-p.]

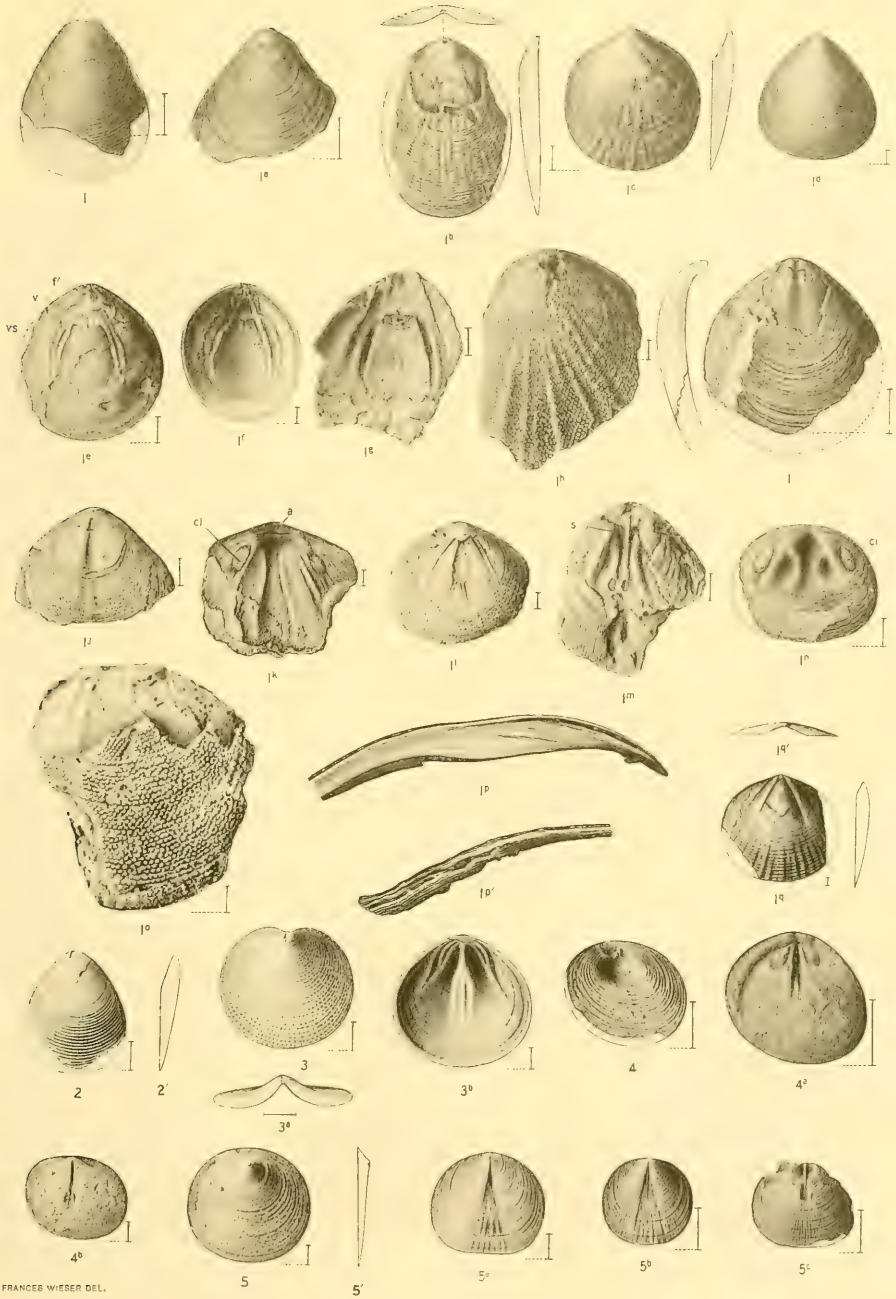
Figure 2. Top and side views of the posterior portion of a ventral valve from Locality **396v**, Lower Cambrian sandstone below the cement factory on Kunda Brook, Government of Esthonia, Russia. U. S. Nat. Mus. Cat. No. 51522a.

Botsfordia cælata (Hall) (p. 603).

[Pl. LIX, figs. 1, 1a-q.]

Figure 3 and 3a. Top and back views of a ventral valve from Locality **39a**, Lower Cambrian limestone north of Easton Station, Washington County, New York. U. S. Nat. Mus. Cat. No. 52039a.

3b. Interior of a dorsal valve from Locality **38**, Lower Cambrian limestone 3 miles west of South Granville, Washington County, New York. U. S. Nat. Mus. Cat. No. 52038a.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

ACROTHELE YORKENSIS Walcott (p. 661).

FIGURE 4. Exterior of the type specimen, a distorted, broken ventral valve, from Locality **48d**, Middle Cambrian shales in railroad cut at York, Pennsylvania. U. S. Nat. Mus. Cat. No. 52031a. Copied from Walcott [1908d, Pl. IX, fig. 10].

4a and 4b. Compressed, exfoliated dorsal valves associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. Nos. 52031b and 52031c, respectively.

ACROTHELE PANDERI Walcott (p. 651).

FIGURES 5 and 5′. Exterior and side views of a ventral valve, the type specimen, from Locality **4v**, Lower Cambrian shales on Gordon Creek, Ovando quadrangle, Montana. U. S. Nat. Mus. Cat. No. 52003a.

5a. Exterior of ventral valve associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 52003b.

5b. Exterior of ventral valve from Locality **5j**, Lower Cambrian shales 6 miles west-northwest of Scapegoat Mountain, Coopers Lake quadrangle, Montana. U. S. Nat. Mus. Cat. No. 52002a.

5c. Partly exfoliated dorsal valve associated with the shell represented by figure 5b. U. S. Nat. Mus. Cat. No. 52002b.

PLATE LX.

PLATE LX.

cl. Cardinal scar.
fa. False area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
s. Median septum.
vs. Vascular sinus.

Acrothele subsidua (White) (p. 656).

[Pl. LX, fig. 8.]

Figure 1. Interior of a ventral valve from Locality **4** (?), drift pieces believed to be from the Wheeler formation, near Antelope Springs, House Range, Utah, showing outline of false area. U. S. Nat. Mus. Cat. No. 15435a. Type specimen, figured by White [1877, Pl. I, fig. 3a] as *Acrotreta? subsidua*.

1a. Exterior of ventral valve from Locality **163**, Middle Cambrian Spence shale member of Ute limestone, Spence Gulch, 15 miles west of Montpelier, Idaho. U. S. Nat. Mus. Cat. No. 52015a.

1b. Exterior of an exfoliated ventral valve associated with the specimen represented by figure 1a, showing several radiating ribs. U. S. Nat. Mus. Cat. No. 52015b.

1c. Exterior of a small ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52015c.

1d. Almost perfect ventral valve in the Langston limestone, Locality **5b**, 2 miles southeast of Malade, Idaho. U. S. Nat. Mus. Cat. No. 52014a.

1e. A cast of the interior of a ventral valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 52014b.

1f. Cast of the interior of a ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52018a.

1g. Exterior of a dorsal valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 52014c.

1h, 1i, and 1j. Exteriors of dorsal valves associated with the ventral valve represented by figure 1a. U. S. Nat. Mus. Cat. Nos. 52015d, 52015e, and 52015f, respectively.

1k. Interior of a dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 15436a.

1l. Interior of a dorsal valve, showing visceral area, and muscle scars on the side of the median ridge. Associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52018b.

1m. Cast of interior of a dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52015g.

1n. Cast of interior of a dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 15435b. Specimen figured by White [1877, Pl. I, fig. 3d] as *Acrotreta? subsidua*.

1o. Enlargement of the apex of a ventral valve 7 mm. in length on which the tubercles are small and the pedicle aperture large. Locality **30g**, Middle Cambrian Marjum limestone in ridge east of Wheeler Amphitheater, House Range, Utah. U. S. Nat. Mus. Cat. No. 52016a.

Acrothele dichotoma Walcott (p. 644).

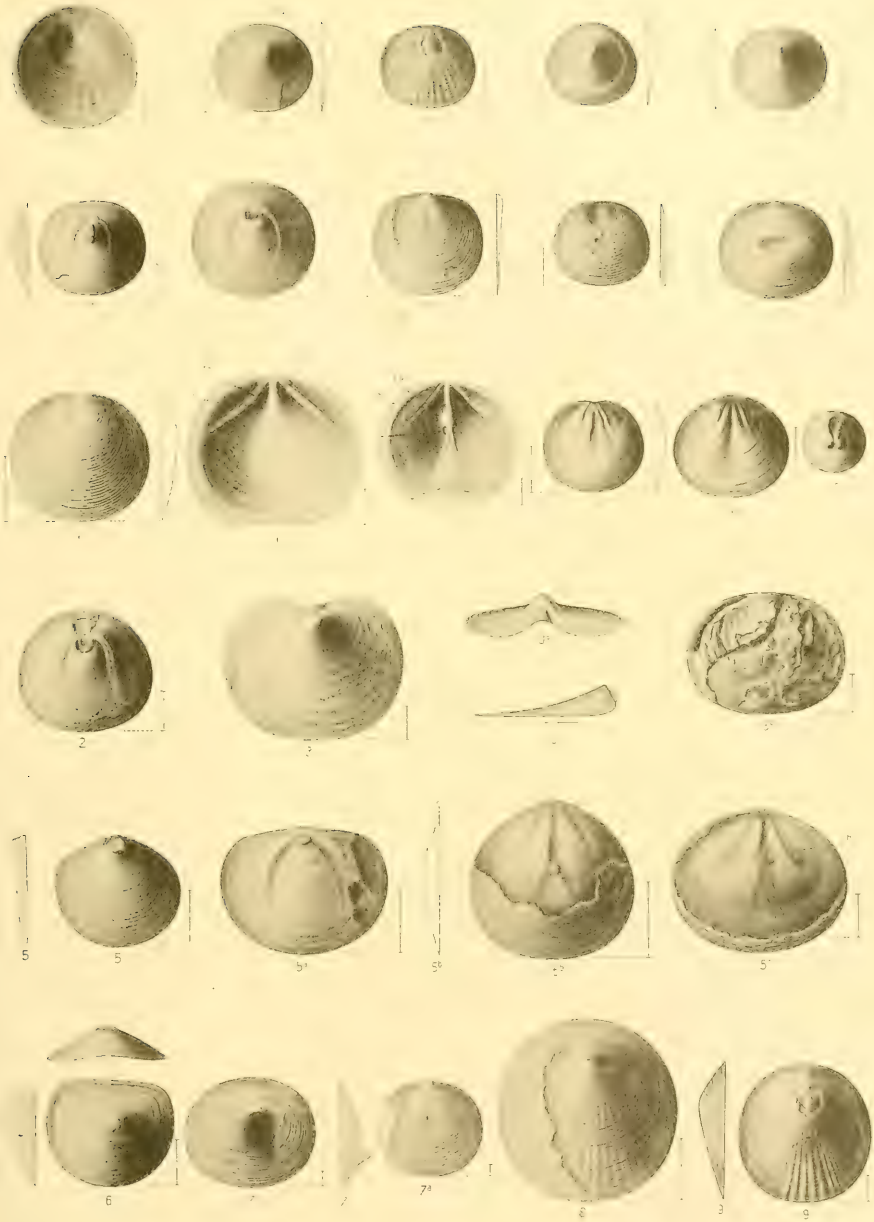
Figure 2. Exfoliated ventral valve from Locality **58**, Middle Cambrian Secret Canyon shale in either New York or Secret Canyon, Eureka district, Nevada, showing false area, main vascular sinuses, and apical callosity. U. S. Nat. Mus. Cat. No. 24595a. Type specimen, figured by Walcott [1884b, Pl. IX, fig. 11].

Acrothele spurri Walcott (p. 656).

Figure 3. Top view of the type specimen, which is a partly exfoliated ventral valve, from Locality **31a**, Lower Cambrian limestone near Pioche, Nevada. U. S. Nat. Mus. Cat. No. 15344a. Copied from Walcott [1908d, Pl. VIII, fig. 14]. That figure was redrawn from the specimen illustrated by Walcott [1886b, Pl. IX, fig. 4] as *Acrothele subsidua*.

3a and 3b. Back and side views of a partly exfoliated ventral valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 15344b. Copied from Walcott [1908d, Pl. VIII, figs. 14″ and 14′].

3c. Exterior of an exfoliated dorsal valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 15344c.



FRANCES WIESER DEL.

H'ELIOTYPE CO BOSTON

Acrothele gamagei (Hobbs) (p. 645).

Figures 5 and 5′. Top view and side outline of a ventral valve. U. S. Nat. Mus. Cat. No. 51986a.

5a. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51986b.

5b and 5b′. Partly exfoliated specimen of a dorsal valve and side outline of same. Original in the Museum of Comparative Zoology; cast in the United States National Museum (Cat. No. 51987a).

5c. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51986c.

The specimens represented are all from Locality **5**, Middle Cambrian siliceous shale on Hayward Creek, Braintree, Massachusetts.

Acrothele woodworthi Walcott (p. 661).

Figure 6. Top, back, and side views of a cast made from the outer surface of a natural mold from Locality **326c**, Lower Cambrian limestone at Nahant, Essex County, Massachusetts. Type specimen in the collection of the Boston Society of Natural History; cast in the United States National Museum (Cat. No. 52030a). Copied from Walcott [1908d, Pl. IX, fig. 11].

Acrothele turneri Walcott (p. 660).

Figures 7 and 7′. Top and side views of a partly crushed ventral valve, the type specimen, from Locality **7r**, Middle Cambrian shales 4 miles south-southeast of Emigrant Peak, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 52028a. Copied from Walcott [1908d, Pl. IX, figs. 12 and 12′].

7a. Exterior of a compressed dorsal valve associated with the specimen represented by figure 7. U. S. Nat. Mus. Cat. No. 52028b.

Acrothele subsidua (White) (p. 656).

[Pl. LX, figs. 1, 1a–o.]

Figure 8. Large compressed ventral valve from Locality **14s**, Middle Cambrian *Ogygopsis* zone on Mount Stephen, British Columbia. U. S. Nat. Mus. Cat. No. 24063a.

Acrothele subsidua hera Walcott (p. 659).

Figures 9 and 9′. Top and side views of an exfoliated ventral valve, the type specimen, showing the concentric striæ and radiating ridges on the inner layers of the shell. From Locality **31a**, Lower Cambrian limestone near Pioche, Nevada. U. S. Nat. Mus. Cat. No. 52024a. Copied from Walcott [1908d, Pl. VIII, figs. 15 and 15′].

PLATE LXI.

PLATE LXI.

cl. Cardinal scars.
F'. Cast of foraminal tube.
fa. False area.
s. Median septum.
vs. Vascular sinuses.

Acrothele matthewi (Hartt) (p. 647).

Figure 1. Ventral valve from Locality **301j**, Middle Cambrian, St. John formation at Ratcliffs Millstream, St. John County, New Brunswick. Specimen figured by Walcott [1884a, Pl. I, fig. 4a], who states that it was labeled by Hartt as No. 342, *Obolus* (*Discina*) *nitidus*, nov. sp.

1a. Dorsal valve from Locality **301k**, Middle Cambrian, St. John formation at St. John, New Brunswick. Type specimen, figured by Hartt [1868, fig. 221, p. 644], and by Walcott [1884a, Pl. I, fig. 4].

1b. Top and side views of an interior cast of a ventral valve from Locality **3**, Upper Cambrian limestones on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51994a.

1c. Cast of the interior of a compressed ventral valve associated with the shell represented by figure 1b, showing vascular canals. U. S. Nat. Mus. Cat. No. 51994b.

1d. Interior of a ventral valve from Locality **6n**, Middle Cambrian shales on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51996a.

1e. Exterior of a ventral valve from Locality **6g**, Middle Cambrian limestone at Chapple Arm Harbor, Trinity Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51995a.

1f. Interior of a dorsal valve associated with the shell represented by figure 1d. U. S. Nat. Mus. Cat. No. 51996b.

1g. Interior of a dorsal valve from Locality **301j**, Middle Cambrian shales on Ratcliffs Millstream, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 18170a.

Acrothele matthewi eryx Walcott (p. 649).

Figure 2. Top and side views of a partly exfoliated ventral valve, the type specimen, from Locality **C4**, Middle Cambrian limestone, Kiulung group, 3 miles southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52520a.

Acrothele matthewi lata Matthew (p. 649).

Figure 3. Interior of a crushed dorsal valve from Locality **301a**, Middle Cambrian sandstones of Division 1b3 on Hanford Brook, St. John County, New Brunswick. University of Toronto, Canada. Type specimen, figured by Matthew [1886, Pl. V, figs. 17 and 17a] and by Hall and Clarke [1892c, Pl. III, figs. 26–28].

Acrothele prima costata (Matthew) (p. 653).

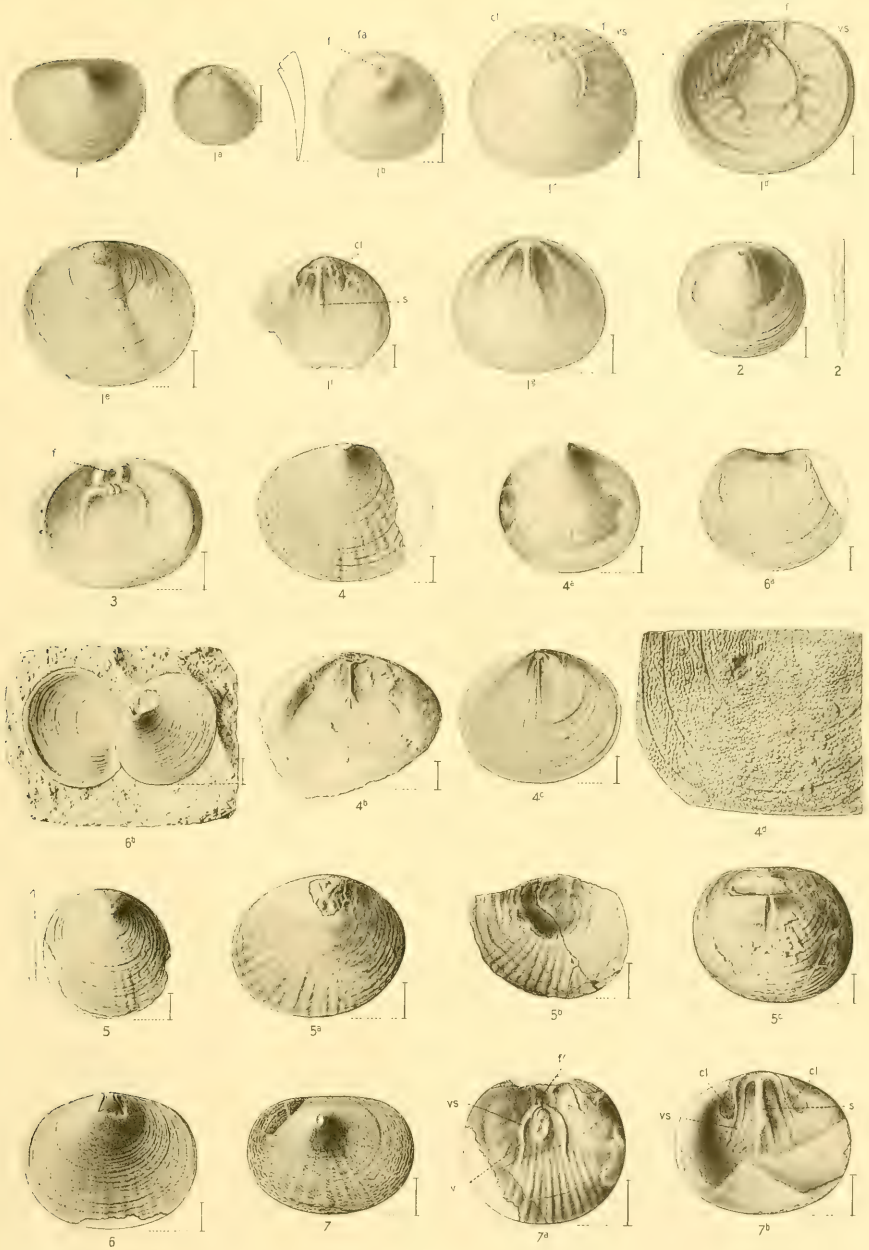
Figure 4. Top view of a broken ventral valve with numerous costæ, from Locality **2h**, Middle Cambrian sandstones of Division 1b2 on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52010a.

4a. A crushed ventral valve with three costæ, associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 52010b.

4b. Interior of a broken dorsal valve associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 52010c.

4c. Interior of a dorsal valve from Locality **6n**, Middle Cambrian shales on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 51984a.

4d. Enlargement of the outer surface of a specimen associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 52010d.



FRANCES WIESER DEL.

H. ELLIOT PE CO. BOSTON

Acrothele matthewi multicostata Matthew (p. 650).

Figure 5. Top and side views of a ventral valve preserving the outer surface from Locality **21**, Middle Cambrian shale at the base of the *Paradoxides* zone on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 56633a.

5a. Partly exfoliated ventral valve, with apex broken off. Locality **2t**, Middle Cambrian shales at Hastings Cove on Kennebecasis Bay, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52000a.

5b. Fragment showing the numerous costæ. University of Toronto, Canada. (Locality unknown.)

5c. Exfoliated dorsal valve associated with the specimen represented by figure 5a. U. S. Nat. Mus. Cat. No. 52000b.

Acrothele prima (Matthew) (p. 653).

[Pl. LXII, fig. 2.]

Figure 6. Top view of a small ventral valve from Locality **2g**, Middle Cambrian sandstones of Division 1b1 of Matthew's *Protolenus* zone, Hanford Brook, St. John County, New Brunswick. University of Toronto, Canada. Type specimen, figured by Matthew [1886, Pl. V, figs. 16 and 16a] as *Acrothele matthewi prima*. The specimen has been figured and refigured; see page 653 for record.

6a. Natural cast of the exterior of a ventral valve from Locality **2i**, Middle Cambrian limestone of Division 1b3 on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 56638a.

6b. A ventral valve with a cast of the exterior of a dorsal valve beside it. Associated with the specimen represented by figure 6a. U. S. Nat. Mus. Cat. No. 56638b.

Acrothele avia Matthew (p. 634).

[Pl. LXII, figs. 1, 1a-k.]

Figure 7. Exterior of a ventral valve from Locality **344b**, Middle Cambrian shales of Division E3d of Matthew's Etcheminian, Dugald Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XVII, fig. 2a].

7a. Interior of a broken ventral valve from Locality **13n′**, Middle Cambrian shales of Division E3e of Matthew's Etcheminian, Dugald Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Type specimen, figured by Matthew [1899b, Pl. III, fig. 1c].

7b. Interior of a dorsal valve from the locality represented by figure 7a. University of Toronto, Canada. Specimen figured by Matthew [1899b, Pl. III, fig. 1f].

PLATE LXII.

PLATE LXII.

c. Area.
cl. Cardinal scar.
F'. Cast of foraminal tube.
h. Central muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
vs. Vascular sinus.

Acrothele avia Matthew (p. 634).

[Pl. LXI, figs. 7, 7a-b.]

Figure 1. Top view of a typical form of the ventral valve from Locality **13n′**, Middle Cambrian sandstones of Division E3e of Matthew's section, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56598a.

1a. Top view of a ventral valve nearly circular in outline from Locality **13d″**, Middle Cambrian sandstones 10 feet below top of Division E2a of Matthew's section, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56601a.

1b. Laterally compressed ventral valve from Locality **13l′**, Middle Cambrian sandstones of Division E3a on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 51970a.

1c. Partly exfoliated ventral valve from Locality **13m**, Middle Cambrian sandstones of Division E3f on Gillis Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56596a. The surface of this specimen is enlarged in figure 1j.

1d. Exfoliated ventral valve (locality unknown). University of Toronto, Canada.

1e. Fragment of the interior of a ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 56598b.

1f. Cast of interior of dorsal valve, from Locality **13n**, Middle Cambrian sandstones of Division E3f of Matthew's section, Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 56597a.

1g. Interior of dorsal valve associated with the specimen represented by figure 1c. U. S. Nat. Mus. Cat. No. 56596b.

1h. Interior of a compressed dorsal valve placed with the specimens from Locality **13m**; the exact locality is, however, unknown. U. S. Nat. Mus. Cat. No. 56596c.

1i. Exfoliated dorsal valve from Locality **344b**, Middle Cambrian shales of Division E3d of Matthew's Etcheminian, Dugald Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XVII, fig. 2b].

1j. Enlargement of a portion of the surface of the specimen represented by figure 1c.

1k. Posterior portion of a ventral valve showing the apex. Associated with the specimen represented by figure 1b. U. S. Nat. Mus. Cat. No. 51970b.

Acrothele prima (Matthew) (p. 653).

[Pl. LXI, figs. 6, 6a-b.]

Figure 2. Partly exfoliated ventral valve from Locality **13t**, Middle Cambrian shaly sandstones of Division E1b on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52009a.

Acrothele proles Matthew (p. 654).

Figure 3. Exterior of a slightly compressed ventral valve from Locality **13m**, Middle Cambrian shaly sandstones of Division E3f on Gillis Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52011a.

3a. Portion of a dorsal valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52011b.

3b. Interior of a fragmentary ventral valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52011c.

3c. Interior of a small slightly distorted ventral valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52011d.

3d. Partly exfoliated dorsal valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52011e.

3e. Partly exfoliated dorsal valve, showing vascular markings on the inner layers of the shell. Locality **13n**, Middle Cambrian shaly sandstones of Division E3f on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52012a.

FRANCES WIESER DEL.

HELIOTYPE CO., BOSTON.

Acrothele proles Matthew—Continued.

Figure 4. A cast of the exterior of the ventral valve, preserving a portion of the shell. From Locality 13m, Middle Cambrian sandstone of Division E3f of Matthew's Etcheminian, Gillis Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. Type specimen, figured by Matthew [1902b, Pl. XVII, fig. 3a].

4a. Fragment of the interior of a dorsal valve (locality unknown). University of Toronto, Canada. The specimen from which this figure is drawn can not be identified with any of the figures given by Matthew [1902b, Pl. XVII, figs. 3a–e].

Botsfordia pulchra Matthew (p. 607).

Figure 5. Exterior and side view of ventral valve. (See note following fig. 5 l.)

5a. Exterior of ventral valve, with reticulate surface ornamentation on young shell only. U. S. Nat. Mus. Cat. No. 52047a.

5b. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 52047b.

5c. Exterior and side view of dorsal valve. (See note following fig. 5 l.)

5d. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52047c.

5e. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 52047d.

5f and 5f′. Top and back views of a ventral valve. U. S. Nat. Mus. Cat. No. 52047e.

5g. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52047f.

5h and 5j. Casts of the interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52047g and 52047h, respectively.

5k. Portion of surface, greatly enlarged, of the specimen represented by figure 5l. U. S. Nat. Mus. Cat. No. 52047i.

5l. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52047i.

The specimens represented are all from Locality 2y, Middle Cambrian sandstone on Catons Island, Long Reach, St. John River, New Brunswick, with the possible exception of the specimens represented by figures 5 and 5c, which can not now be located in the collections of the United States National Museum. These figures may have been drawn from specimens loaned to the Museum and since returned.

PLATE LXIII.

PLATE LXIII.

cl. Cardinal scars.
f. Flexure line of area.
F'. Cast of foraminal tube.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
k. Middle lateral muscle scar.
l. Outside lateral muscle scar.
p. Pedicle furrow.
s. Median septum.

Acrothele ceratopygarum (Brögger) (p. 640).

Figures 1 and 1a. Top and side views of a ventral valve, the type specimen, from Locality **323h**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at Vestfossen, 10 miles south-southwest of Christiania, Norway. Copied from Brögger's figures [1882, Pl. X, figs. 1a and 1b] of *Discina* (*Acrotreta ?*) *ceratopygarum*.

1b and 1c. Top and side views of an exfoliated ventral valve associated with the valve represented by figures 1 and 1a. U. S. Nat. Mus. Cat. No. 51977a.

Acrothele borgholmensis Walcott (p. 639).

Figures 2 and 2a. Top and side views of a partly exfoliated ventral valve, the type specimen, from Locality **310d**, Upper Cambrian *Ceratopyge* slate at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 51974a. Copied from Walcott [1908d, Pl. VIII, figs. 12 and 12'].

2b. Interior of a small dorsal valve associated with the specimen represented by figures 2 and 2a. U. S. Nat. Mus. Cat. No. 51974b.

Acrothele? minuta Walcott (p. 650).

Figure 3. Exterior view of a partly exfoliated dorsal valve, the type specimen, from Locality **C6**, Middle Cambrian shaly limestone 2.5 miles southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52519a.

Acrothele rara Walcott (p. 655).

Figure 4. Cast of interior of a ventral valve, the type specimen, from Locality **C57**, Middle Cambrian shale 3 miles south of Kaokiapu, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52518a.

4a. Cast of interior of a dorsal valve associated with the shell represented by figure 4. U. S. Nat. Mus. Cat. No. 52518b.

Acrothele sp. undt. *a* Walcott (p. 662).

Figure 5. Top and side view of type specimen from Locality **319b**, Lower Cambrian limestone at St. Simon, Quebec, Canada. U. S. Nat. Mus. Cat. No. 52032a.

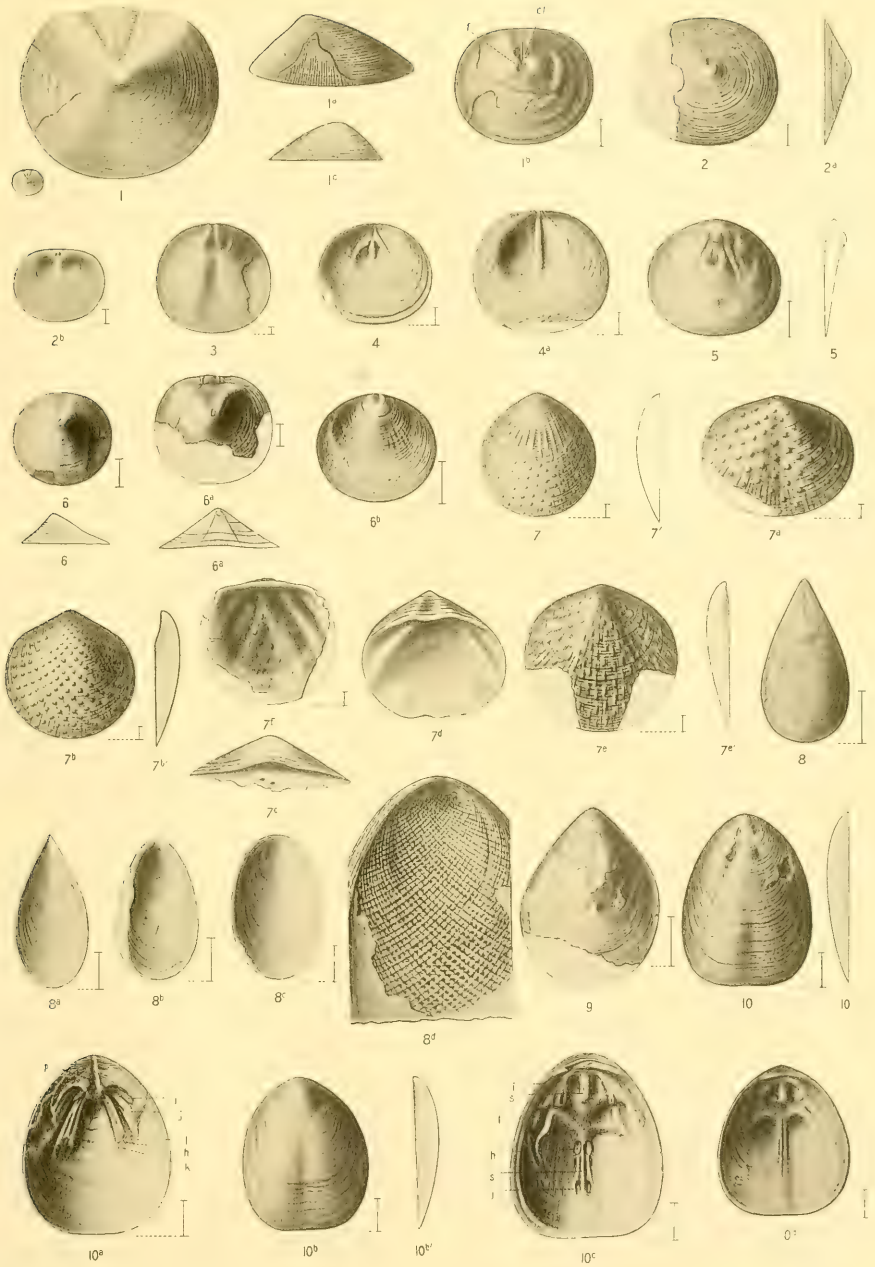
Acrothele colleni Walcott (p. 640).

[Text figs. 55A–E, p. 641.]

Figures 6 and 6'. Top and side views of the type specimen, a ventral valve, from Locality **4q**, Middle Cambrian shale near Gordon Mountain, Ovando quadrangle, Montana. U. S. Nat. Mus. Cat. No. 51973a.

6a and 6a'. Top and back views of the posterior portion of a ventral valve associated with the shell represented by figure 6. U. S. Nat. Mus. Cat. No. 51973b.

6b. Exterior of dorsal valve associated with the shell represented by figure 6. U. S. Nat. Mus. Cat. No. 51973c.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Helmersenia ladogensis (Jeremejew) (p. 368).

Figure 7. Exterior view and side outline of a ventral valve from Locality **336p**, Upper Cambrian sandstone at Kunitz, Pskow, Russia. U. S. Nat. Mus. Cat. No. 51941a.

7a. Exterior of a transverse dorsal valve from Locality **336o**, Upper Cambrian sandstone at Koporje, St. Petersburg, Russia. U. S. Nat. Mus. Cat. No. 51940a.

7b and 7b′. Exterior of a rounded ventral valve, and side outline, associated with the specimen represented by figure 7a. U. S. Nat. Mus. Cat. No. 51940b.

7c. Posterior view of a dorsal valve from Locality **336q**, Upper Cambrian sandstone near Ladoga, Government of St. Petersburg, Russia. Copied from Pander [1861, Pl. II, fig. 2f]

7d. Interior view of a ventral valve, the type specimen, associated with the valve represented by figure 7c. Copied from Pander [1861, Pl. II, fig. 2d].

7e. Exterior of a dorsal? valve associated with the specimen represented by figure 7a. U. S. Nat. Mus. Cat. No. 51940c.

7f. Interior of a ventral? valve associated with the specimen represented by figure 7a. U. S. Nat. Mus. Cat. No. 51940d.

Obolus (Westonia) elongatus Walcott (p. 459).

Figure 8. Compressed, exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 51722b.

8a. Exfoliated interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51722a. Copied from Walcott [1908d, Pl. VII, fig. 12].

8b and 8c. Exfoliated interiors of dorsal valves. U. S. Nat. Mus. Cat. Nos. 51722c and 51722d, respectively.

8d. Enlargement of a portion of the matrix of the outer surface of the dorsal valve represented by figure 8b. The spaces inclosed by the oblique lines are not so convex as represented on the figure. U. S. Nat. Mus. Cat. No. 51722c.

The specimens represented are all from Locality **105x**, Middle Ordovician shales in Wasatch Canyon, north of Brigham, Boxelder County, Utah.

Obolus (Westonia) notchensis Walcott (p. 463).

Figure 9. Fragment of a ventral valve, the type specimen, preserving a portion of the outer surface, from Locality **105t**, Lower Ordovician limestone on Notch Peak, House Range, Utah. U. S. Nat. Mus. Cat. No. 51731a. Copied from Walcott [1908d, Pl. VII, fig. 13].

Obolus (Fordinia) perfectus Walcott (p. 429).

Figures 10 and 10′. Exterior and side view of a ventral valve. U. S. Nat. Mus. Cat. No. 51947b.

10a. Interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51947a. Copied from Walcott [1908d, Pl. VII, fig. 16].

10b. Exterior and side view of a dorsal valve. U. S. Nat. Mus. Cat. No. 51947c.

10c and 10d. Interiors of dorsal valves. U. S. Nat. Mus. Cat. Nos. 51947d and 51947e, respectively.

The specimens represented are all from Locality **30n**, Middle Cambrian Weeks limestone, in Weeks Canyon, House Range, Utah.

PLATE LXIV.

PLATE LXIV.

a. Outer lateral space of area.
cl. Cardinal scars.
f. Flexure line of area.
fa. False area.
p. False pedicle groove.
h. Central scars.
s. Median septum or ridge.
v. Visceral area.
vs. Main vascular sinus.
x″. Cast of apical callosity.

Acrotreta attenuata Meek (p. 675).

[Pl. LXXIX, figs. 6 and 6a.]

Figures 1, 1′, 1″, and 1a, 1a′, 1a″. Top views with side and back views of ventral valves in the material upon which Meek founded the species. From Locality **302**, Middle Cambrian limestone east of West Gallatin (Gallatin) River, above Gallatin, Montana. U. S. Nat. Mus. Cat. Nos. 7867a and 7867b, respectively. Figure 1 represents the type specimen.

1b, 1b′, 1b″, and 1c, 1c′, 1c″. Top, side, and back views of two ventral valves from Locality **156a**, Middle Cambrian limestones north of East Gallatin River, near Hillsdale, Montana. U. S. Nat. Mus. Cat. Nos. 52063a and 52063b, respectively.

1d, 1d′, 1d″; 1e, 1e′, 1e″; and 1f, 1f′, 1f″. Top, side, and back views of three ventral valves, from Locality **4n**, Middle Cambrian limestone in the divide at the head of Jackson Creek, Teton Mountains, Wyoming. U. S. Nat. Mus. Cat. Nos. 52067a, 52067b, and 52067c, respectively.

1g, 1g′, and 1g″. Top, side, and back views of a ventral valve from Locality **159**, Middle Cambrian limestone on the north side of West Gallatin (Gallatin) River, Montana. U. S. Nat. Mus. Cat. No. 52064a.

1h. Dorsal valve associated with the ventral valves represented by figures 1 and 1a. U. S. Nat. Mus. Cat. No. 7867c.

1i. Interior of ventral valve, showing base of apical callosity, vascular sinuses, and cardinal scars. From Locality **10y**, Middle Cambrian Marjum limestone, southeast of Marjum Pass, House Range, Utah. U. S. Nat. Mus. Cat. No. 52070a.

1j, 1k, and 1 l. Top, back, and side views of a cast of the interior of a ventral valve associated with the shell represented by figure 1i. U. S. Nat. Mus. Cat. No. 52070b.

1m. Interior of a dorsal valve associated with the specimen represented by figure 1i. U. S. Nat. Mus. Cat. No. 52070c.

1n. Interior of a dorsal valve from Locality **3s**, Middle Cambrian shales of the Wheeler formation, east of Antelope Springs, House Range, Utah. U. S. Nat. Mus. Cat. No. 52069a.

1o. Exterior of a dorsal valve associated with the specimen represented by figure 1n. U. S. Nat. Mus. Cat. No. 52069b.

Acrotreta definita Walcott (p. 683).

Figures 2, 2′, 2″; 2a, 2a′, 2a″; and 2b, 2b′, 2b″. Top, side, and back views of typical forms of the ventral valve. U. S. Nat. Mus. Cat. Nos. 35270a, 35270b, and 35270c, respectively.

2c, 2c′, and 2c″. Cast of the interior of a ventral valve, the type specimen, with back and side views. U. S. Nat. Mus. Cat. No. 35270d.

2d, 2d′, and 2d″. Top, back, and side views of the cast of the interior of a dorsal valve, showing the area, cardinal scar, etc., with unusual clearness. U. S. Nat. Mus. Cat. No. 35270e.

2e, 2f, and 2g. Exterior views of three dorsal valves, illustrating variation in outline. U. S. Nat. Mus. Cat. Nos. 35270f, 35270g, and 35270h, respectively.

The specimens represented by figures 2, 2a–g are from Locality **163**, Middle Cambrian Spence shale member of Ute limestone, Spence Gulch, 15 miles west of Montpelier, Idaho.

Figures 3, 3a, and 3b. Top, back, and side views of a cast of a ventral valve from Locality **55**, Middle Cambrian Eldorado limestone in New York Canyon, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 35271a.

FRANCES WIESER DEL.

PLATE LXV.

PLATE LXV.

a. Area.
a′. Outer lateral space of area.
cl. Cardinal scars.
fa. False area.
fp. False pedicle groove.
h. Central scars.
s. Median septum or ridge.
vs. Main vascular sinus.
x″. Cast of apical callosity.

Acrotreta idahoensis Walcott (p. 687).

[Pl. LXVIII, figs. 2, 2a-g.]

Figures 1, 1′, 1″; 1a, 1a′, 1a″; 1b, 1b′, 1b″; and 1c, 1c′, 1c″. Top, side, and back views of typical forms of the ventral valve. U. S. Nat. Mus. Cat. Nos. 52091a, 52091b, 52091c, and 52091d, respectively. Figure 1b represents the type specimen.

1d, 1d′, and 1d″. Top, back, and side views of cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52091e.

1e. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52091f.

1f. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52091g.

1g. Natural cast of the interior of the dorsal valve represented by figure 1f. U. S. Nat. Mus. Cat. No. 52091g.

1h and 1i. Exteriors of two dorsal valves. U. S. Nat. Mus. Cat. Nos. 52091h and 52091i, respectively.

The specimens represented are all from Locality **5c**, Upper Cambrian limestone in Twomile Canyon, 2 miles southeast of Malade, Idaho.

Acrotreta attenuata var. Walcott (p. 676).

Figures 2, 2′, and 2″. Top, side, and back views of a specimen with a more distinctly marked false area than usually occurs in typical *A. attenuata*. Associated with the type of that species in Locality **302**, Middle Cambrian limestone east of West Gallatin (Gallatin) River above Gallatin, Montana. U. S. Nat. Mus. Cat. No. 52071a.

Acrotreta kutorgai Walcott (p. 692).

[Text fig. 58, p. 692.]

Figures 3, 3′, 3″, and 3a, 3a′, 3a″. Top, back, and side views of the exterior of two ventral valves from Locality **139a**, Middle Cambrian limestone near Chepultepec, Jefferson County, Alabama. U. S. Nat. Mus. Cat. Nos. 58305a and 58305b.

3b, 3b′, 3b″, and 3c, 3c′, 3c″. Top, back, and side views of casts of the interior of ventral valves. U. S. Nat. Mus. Cat. Nos. 35277a and 35277b, respectively. Figure 3b represents the type specimen.

3d. Side view of cast of ventral valve, showing cast of pedicle tube. U. S. Nat. Mus. Cat. No. 35277c.

3e. Cast of pedicle tube, showing lines of shell growth. U. S. Nat. Mus. Cat. No. 35277d.

3g. View into cast of ventral valve, with cast of area of dorsal valve in position. U. S. Nat. Mus. Cat. No. 35277e. This specimen is tipped so as to show the cast of the areas of both the ventral and dorsal valves in text figure 58, page 692.

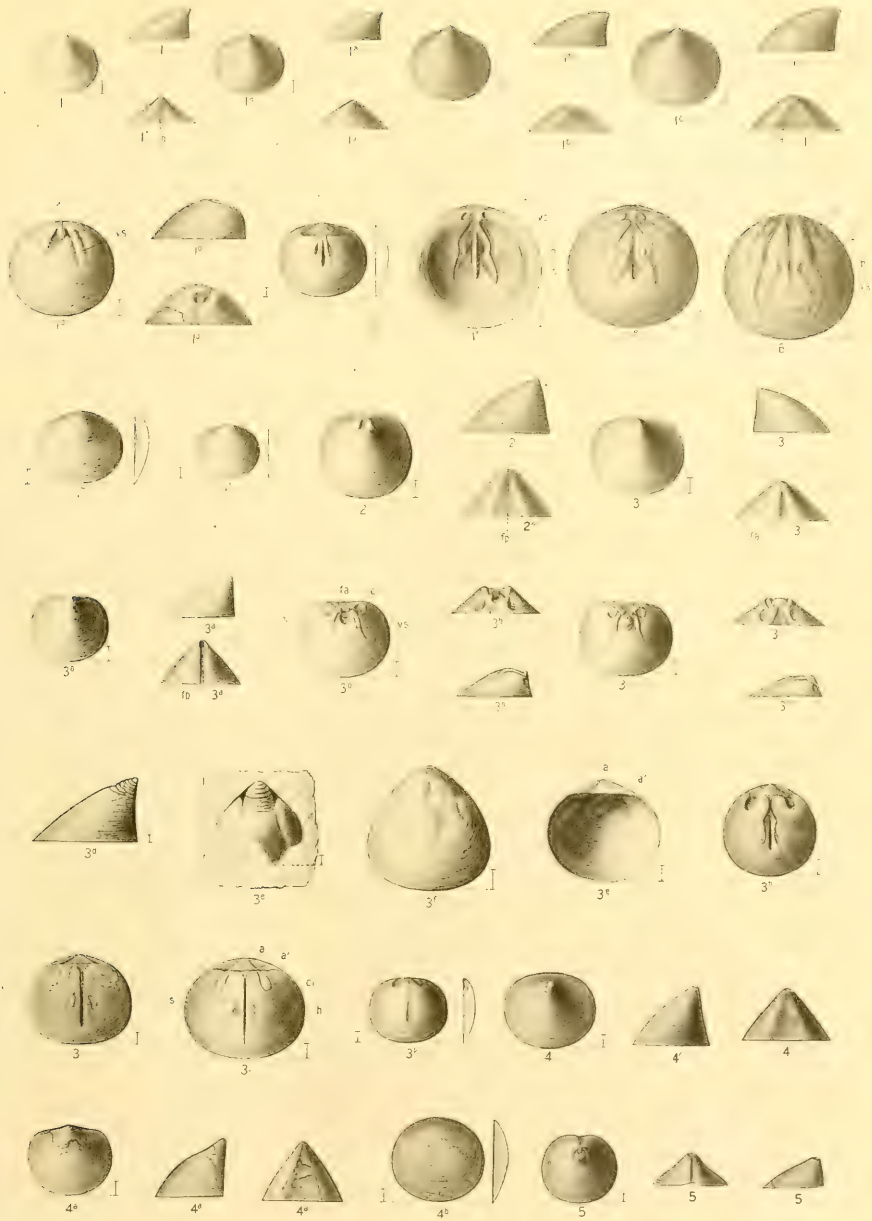
3h, 3i, 3j, and 3k. Casts of interiors of dorsal valves, illustrating variation in median ridge, muscle scars, etc. U. S. Nat. Mus. Cat. Nos. 35277f, 35277g, 35277h, and 35277i, respectively.

The specimens represented by figures 3b–k are all from Locality **90x**, Middle Cambrian siliceous nodules in the Conasauga shale, Coosa Valley, Cherokee County, Alabama.

Acrotreta rudis Walcott (p. 702).

[Pl. LXXV, fig. 1.]

Figure 3f. Ventral valve, the type specimen, flattened in the shale of Locality **101a**, Middle Cambrian, 3.5 miles southwest of Rogersville, Hawkins County, Tennessee. U. S. Nat. Mus. Cat. No. 52111a. Copied from Walcott [1908d, Pl. IX, fig. 5].



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

ACROTRETA IDAHOENSIS ALTA Walcott (p. 689).

FIGURES 4, 4′, and 4″. Top, side, and back views of a ventral valve from Locality **15d**, Upper Cambrian limestone near Cave Spring, Fish Spring Range, Utah. U. S. Nat. Mus. Cat. No. 52099a.

4a, 4a′, and 4a″. Top, side, and back views of a ventral valve from Locality **58**, Middle Cambrian shaly limestone in either New York or Secret Canyon, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 35273a. Type specimen, figured by Walcott [1884b, Pl. I, fig. 1a].

4b. Dorsal valve associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 52099b.

ACROTRETA IDAHOENSIS SULCATA Walcott (p. 690).

FIGURES 5, 5′, and 5″. Top, side, and back views of a ventral valve, the type specimen, with the apex broken off. From Locality **322a**, Middle Cambrian Langston limestone near Paris, Idaho. U. S. Nat. Mus. Cat. No. 35275a.

ACROTRETA EMMONSI Walcott (p. 684).

FIGURE 6. Cast of the interior of a dorsal valve, the type specimen, from Locality **35a**, Lower Cambrian limestone on Bald Mountain, Washington County, New York, showing vascular markings and muscle scars. U. S. Nat. Mus. Cat. No. 52087a.

PLATE LXVI.

PLATE LXVI.

a'. Outer lateral space of area.
cl. Cardinal scar.
fp. False pedicle groove.
h. Central muscle scar.
s. Median septum or ridge.
vs. Main vascular sinus.
x''. Cast of apical callosity.

Acrotreta gemma Billings (p. 685).

Figures 1, 1', 1'', and 1a, 1a', 1a''. Top, side, and back views of two ventral valves from Locality **314d**, Lower Ordovician limestone 4 miles northeast of Portland Creek, Newfoundland. Mus. Geol. Survey Canada. Figure 1 may be taken as the type.

1b. Enlargement of the apex and foraminal opening of a ventral valve associated with the specimens represented by figures 1 and 1a.

Figures 1, 1a–b are drawn from the specimens illustrated by Billings [1865, figs. 201b, d, e, and f].

Acrotreta ovalis Walcott (p. 699).

Figures 2, 2a, and 2b. Top, side, and back views of the type specimen, a ventral valve, from Locality **314d**, Lower Ordovician limestone 4 miles northeast of Portland Creek, Newfoundland. Mus. Geol. Survey Canada.

Acrotreta gemmula Matthew (p. 686).

[Pl. LXXVII, figs. 5, 5a–f.]

Figures 3, 3', and 3''. Top, back, and side views of the outer surface of a ventral valve (locality unknown). University of Toronto, Canada.

3a. Top, back, and side views of the cast of the interior of a ventral valve in which the cast of the base of the foraminal tube is unusually large. Locality **301a**, Middle Cambrian sandstones in Division 1b3 of Matthew on Hanford Brook, St. John County, New Brunswick. University of Toronto, Canada. Type specimen, figured by Matthew [1894, Pl. XVI, fig. 2a].

3b and 3c. Cast and interior of a dorsal valve from the locality represented by figure 3a. University of Toronto, Canada. Specimen figured by Matthew [1894, Pl. XVI, fig. 2b].

Acrotreta sagittalis magna (Matthew) (p. 706).

Figures 4 and 4a. Top and side views of a cast of the interior of a ventral valve from Locality **2s**, Middle Cambrian limestone at Hastings Cove, northeast of St. John, New Brunswick. University of Toronto, Canada. Specimen figured by Matthew [1897b, Pl. I, fig. 1b] as *Linnarssonia belti magna*.

4b. Cast of the interior of a dorsal valve from the locality represented by figure 4. University of Toronto, Canada. Type specimen, figured by Matthew [1897b, Pl. I, fig. 1a] as *Linnarssonia belti magna*.

4c, 4c', and 4c''. Top, back, and side views of a small well-preserved ventral valve from Locality **2 1**, Middle Cambrian limestone on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 35284a.

4d. Interior of a partly crushed ventral valve associated with the shell represented by figure 4c. U. S. Nat. Mus. Cat. No. 35284b.

4e and 4f. Interior of a dorsal valve and natural cast of same associated with the shell represented by figure 4c. U. S. Nat. Mus. Cat. Nos. 35284c and 35284d, respectively.

Acrotreta gracia Walcott (p. 687).

Figures 5, 5', and 5''. Top, back, and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 35272a.

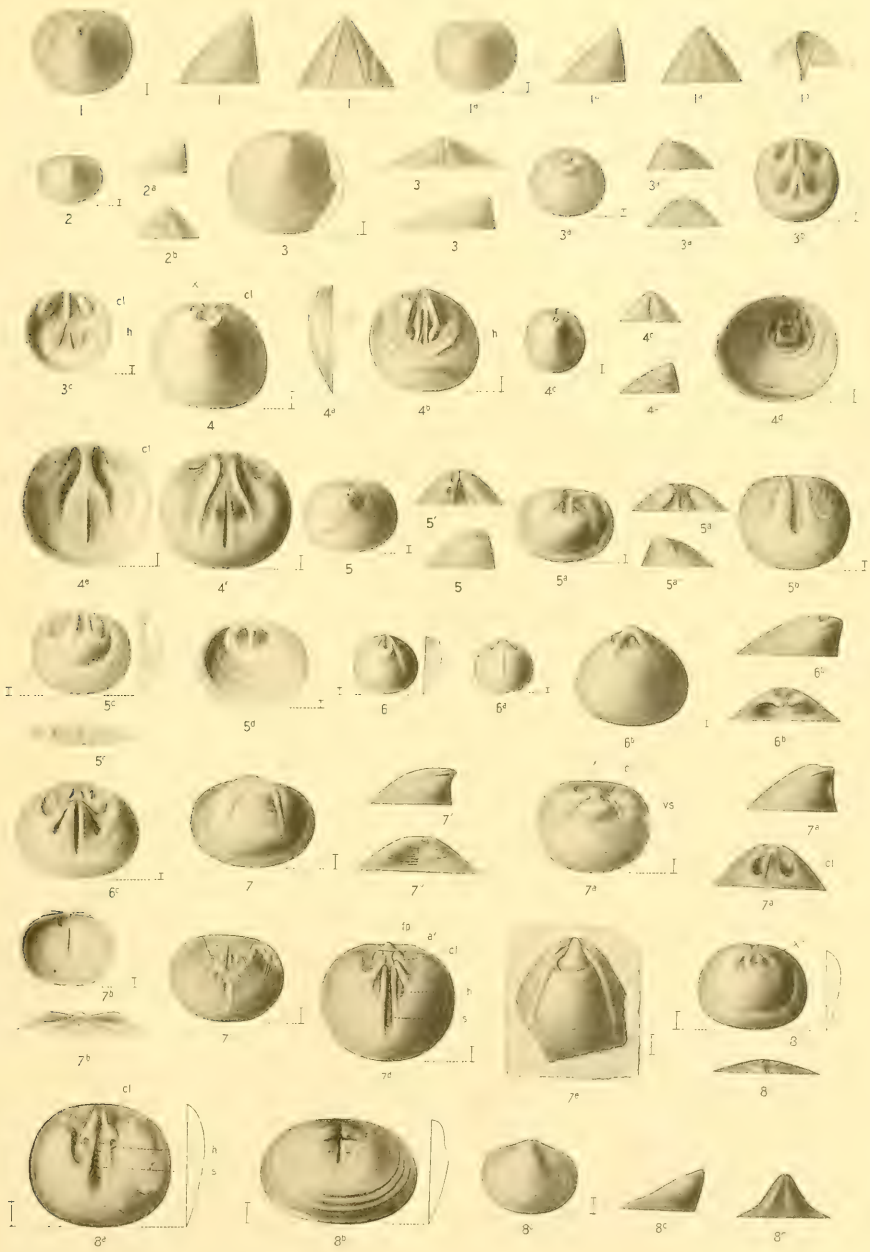
5a, 5a', and 5a''. Top, back, and side views of a cast of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35272b.

5b. Cast of part of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35272c.

5c and 5c'. Top, side, and back views of a cast of a dorsal valve. U. S. Nat. Mus. Cat. No. 35272d.

5d. Cast of the exterior of a dorsal valve, with a portion of the posterior part of the shell. U. S. Nat. Mus. Cat. No. 35272e.

The specimens represented are all from Locality **2s**, Middle Cambrian limestone at Hastings Cove, on Kennebecasis Bay, northeast of St. John, New Brunswick.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON.

Acrotreta convexa Walcott (p. 682).

Figure 6. Cast of the interior of a ventral valve, the type specimen, from Locality **3n**, Upper Cambrian sandstones on Salmon River, Gillis Hill, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 35268a.

6a. Cast of the interior of a dorsal valve associated with the shell represented by figure 6. U. S. Nat. Mus. Cat. No. 35268b.

6b, 6b′, and 6b″. Top, side, and back views of the cast of a ventral valve from Locality **10i**, Upper Cambrian shale on Barachois River, just north of the Boisdale Road, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52084a.

6c. Cast of interior of dorsal valve from Locality **10e**, Upper Cambrian shales on east branch of Barachois River, north of the crossroad from Boisdale to Upper Leitches Creek, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52085a.

Acrotreta bisecta Matthew (p. 678).

Figures 7, 7′, and 7″. Top, side, and back views of a partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 52073a.

7a, 7a′, and 7a″. Top, side, and back views of cast of ventral valve. U. S. Nat. Mus. Cat. No. 52073b.

7b. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52073c.

7b′. Enlargement of the area of figure 7b.

7c. Cast of the interior of a dorsal valve on which the lines of growth about the cardinal scars are beautifully shown. U. S. Nat. Mus. Cat. No. 52073d.

7d. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52073e.

The specimens represented by figures 7, 7a–d are from Locality **3q**, Upper Cambrian shale in Barachois Glen, south of Little Bras d'Or Lake, Cape Breton, Nova Scotia.

Figure 7e. Cast of the interior of the posterior portion of a ventral valve in which the cast of the main vascular sinuses is finely preserved; also the cast of the base of the pedicle tube. Locality **10e**, Upper Cambrian shales on east branch of Barachois River, north of crossroad from Boisdale to Upper Leitches Creek, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52077a.

Acrotreta depressa (Walcott) (p. 683).

Figures 8 and 8′. Top, side outline, and back view of the type specimen, a cast of the interior of a compressed ventral valve, from Locality **14s**, Middle Cambrian shaly limestones (*Ogygopsis* zone) on Mount Stephen, British Columbia. U. S. Nat. Mus. Cat. No. 52086c. Copied from Walcott [1908c, Pl. I, fig. 3c].

8a and 8b. Casts of the interior of two dorsal valves associated with the shell represented by figure 8. U. S. Nat. Mus. Cat. Nos. 52086a and 52086b, respectively. Figure 8a is copied from Walcott [1908c, Pl. I, fig. 3b].

8c, 8c′, and 8c″. Top, side, and back views of a ventral valve occurring in the same beds with the specimens represented by figures 8, 8a–b, but which is very doubtfully referred to this species. U. S. Nat. Mus. Cat. No. 52086d. Figures 8c and 8c′ are copied from Walcott [1908c, Pl. I, figs. 3 and 3a, respectively].

PLATE LXVII.

PLATE LXVII.

cl. Cardinal scar.
fa. False area.
fp. False pedicle groove.
h. Central muscle scar.
l. Outside lateral muscle scar.
s. Median septum.
v. Visceral cavity.
x. Foraminal aperture.
x′. Cast of foraminal aperture.

Acrotreta microscopica (Shumard) (p. 693).

Figures 1, 1′, 1″; 1a, 1a′, 1a″; 1b, 1b′, 1b″; and 1c, 1c′, 1c″. Top, back, and side views of the exterior of four ventral valves illustrating variations in outline, position of the apex, etc. Locality **67**, Upper Cambrian limestone, on Tatur Hill, northeast of Burnet, Burnet County, Texas. U. S. Nat. Mus. Cat. Nos. 52120a, 52120f, 52120b, and 52120c, respectively.

1d, 1d′, and 1d″. Top, back, and side views of a ventral valve from Locality **70e**, Upper Cambrian limestone, near Morgans Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 52118a.

1e and 1g. Exteriors of dorsal valves associated with the shells represented by figures 1, 1a–c. U. S. Nat. Mus. Cat. Nos. 52120d and 52120e, respectively.

1f and 1h. Exteriors of dorsal valves associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 52118b and 52118c, respectively.

1o, 1o′, and 1o″. Top, side, and back views of the cast of a small ventral valve from Locality **68**, Upper Cambrian limestone, on Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. No. 52504a.

2, 2′, and 2″. Top, back, and side views of a ventral valve with an unusually well-defined false area. U. S. Nat. Mus. Cat. No. 52119a.

2a, 2a′, and 2a″. Top, back, and side views of a ventral valve which has lost the apex and exposed the foraminal tube. U. S. Nat. Mus. Cat. No. 52119b.

2b and 2c. Side views of two elevated ventral valves. U. S. Nat. Mus. Cat. Nos. 52119c and 52119d, respectively.

2d. Exterior of dorsal valve with side outline. U. S. Nat. Mus. Cat. No. 52119e.

The specimens represented by figures 2, 2a–d are all from Locality **80**, Upper Cambrian limestone, 2 miles north of Aurum, Schell Creek Range, White Pine County, Nevada.

Acrotreta microscopica tetonensis Walcott (p. 694).

Figures 3, 3′, 3″; 3a, 3a′, 3a″; and 3b, 3b′, 3b″. Top, back, and side views of three ventral valves. U. S. Nat. Mus. Cat. Nos. 35280a, 35280b, and 35280e, respectively. Figure 3 represents the type specimen.

3c and 3d. Exterior views, and outlines showing convexity, of two dorsal valves. U. S. Nat. Mus. Cat. Nos. 35280c and 35280d, respectively.

The specimens represented by figures 3, 3a–d are from Locality **4e**, Middle Cambrian limestones in divide at the head of Jackson Creek, Teton Mountains, Wyoming.

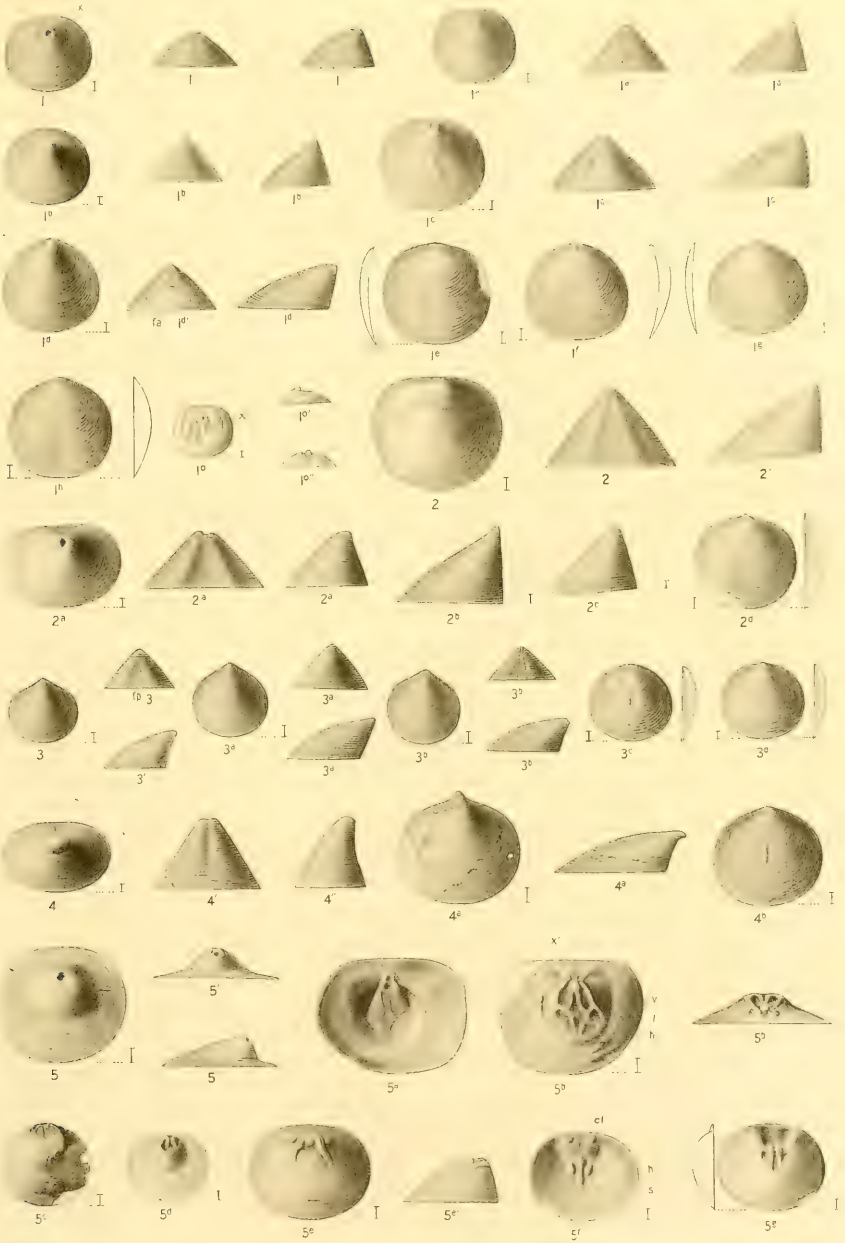
Acrotreta microscopica missouriensis Walcott (p. 694).

Figures 4, 4′, and 4″. Top, back, and side views of the type specimen, a ventral valve that has been slightly compressed longitudinally, thus elevating it, also emphasizing the median furrow on the false area. U. S. Nat. Mus. Cat. No. 35728a.

4a and 4a′. Top and side views of a ventral valve that has been depressed by compression, the apex being forced backward over the false area. U. S. Nat. Mus. Cat. No. 35278b.

4b. Exterior of dorsal valve, showing traces of radiating striæ and numerous indentations caused by the fine grains of sand in the matrix. U. S. Nat. Mus. Cat. No. 35278c.

The specimens represented are all from Locality **11k**, Middle Cambrian shale, St. Francois County, Missouri.



FRANCES WIESER DEL.

ACROTRETA ARGENTA Walcott (p. 674).

FIGURES 5, 5′, and 5″. Top, back, and side views of a compressed ventral valve in which the foraminal tube is exposed by the removal of the apex. U. S. Nat. Mus. Cat. No. 52062a.

5a. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52062b.

5b and 5b′. Cast of a ventral valve that preserves the outline of the visceral cavity and the trapezoidal area that includes the central, outside lateral, and middle lateral muscle scars. It is the type specimen. U. S. Nat. Mus. Cat. No. 52062c.

5c. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52062d.

5d. Top view of a crushed ventral valve. The dark portion preserves the shell. U. S. Nat. Mus. Cat. No. 52062e.

The specimens represented by figures 5, 5a–d are from Locality 8b′, Upper Cambrian arenaceous shales, 1 mile southwest of Emigrant Pass, Esmeralda County, Nevada.

FIGURES 5e and 5e′. Top and side views of a ventral valve from Locality 7y, Upper Cambrian limestone, 2.5 miles southeast of Emigrant Pass, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 35265a.

5f and 5g. Interior and cast of dorsal valves from Locality 7x, Upper Cambrian limestone, 2.5 miles southeast of Emigrant Pass, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. Nos. 35265b and 35265c, respectively.

PLATE LXVIII.

PLATE LXVIII.

cl. Cardinal scar.
fa. False area.
fp. False pedicle groove.
h. Central muscle scar.
s. Median septum or ridge.
v. Visceral area.
vs. Main vascular sinus.

Acrotreta curvata Walcott (p. 682).

Figures 1, 1′, 1″; 1a, 1a′, 1a″; and 1b, 1b′, 1b″. Top, side, and back views of the exterior of ventral valves. U. S. Nat. Mus. Cat. Nos. 35269a, 35269b, and 35269c, respectively. Figure 1a represents the type specimen.

1c, 1c′, 1c″; 1d, 1d′, 1d″; and 1e, 1e′, 1e″. Top, side, and back views of casts of the interior of ventral valves. U. S. Nat. Mus. Cat. Nos. 35269d, 35269e, and 35269f, respectively.

1f, 1g, 1h, and 1i. Exterior and outline of convexity of four dorsal valves. U. S. Nat. Mus. Cat. Nos. 35269g, 35269h, 35269i, and 35269j, respectively. The specimen represented by figure 1g was figured by Walcott [1884b, Pl. I, fig. 1d] as *Acrotreta gemma*. The specimen has been repeatedly figured (see p. 682).

1k and 1l. Interiors of two dorsal valves. U. S. Nat. Mus. Cat. Nos. 35269k and 35269l, respectively. The specimen represented by figure 1l was figured by Walcott [1884b, Pl. I, fig. 1e] as *Acrotreta gemma*. The specimen has been repeatedly figured (see p. 682).

1m, 1m′, 1m″, and 1n, 1n′, 1n″. Top, side, and back views of casts of the interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 35269m and 35269n, respectively.

The specimens represented are all from Locality **203a**, passage beds between the Upper Cambrian and the Ordovician, Hamburg Ridge, southwest of Wood Cone, Eureka district, Nevada.

Acrotreta idahoensis Walcott (p. 687).

[Pl. LXV, figs. 1, 1a-i.]

Figures 2, 2′, 2″; 2a, 2a′, 2a″; 2b, 2b′, 2b″; and 2c, 2c′, 2c″. Top, side, and back views of four ventral valves. U. S. Nat. Mus. Cat. Nos. 52089a, 52089b, 52089c, and 52089d, respectively.

2d, 2e, and 2f. Exterior and outline of convexity of three dorsal valves. U. S. Nat. Mus. Cat. Nos. 52089e, 52089f, and 52089g, respectively.

The specimens represented by figures 2, 2a–f are from Locality **88a**, Middle Cambrian limestone in the northern suburbs of Deadwood, Black Hills, South Dakota.

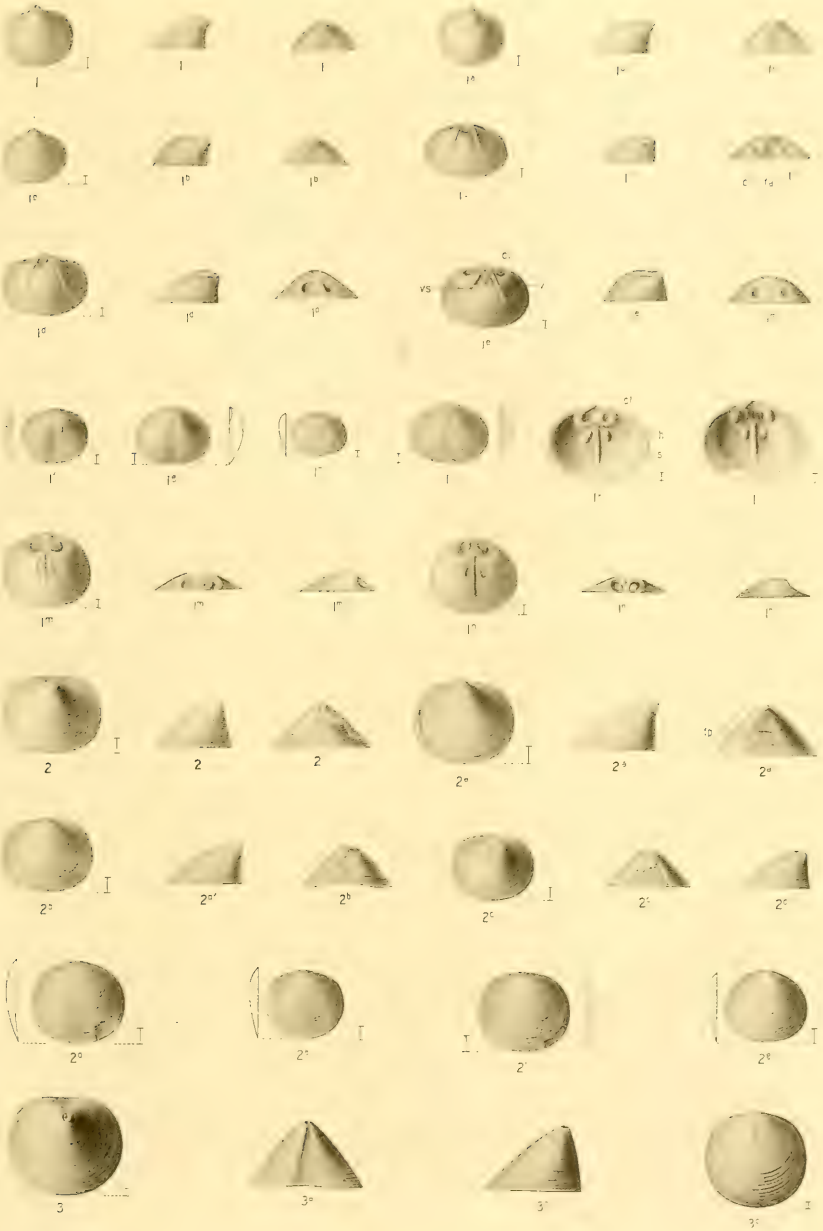
Figure 2g. Ventral valve from Locality **165**, Middle Cambrian limestone, about 1 mile below the main part of Deadwood, Black Hills, South Dakota. U. S. Nat. Mus. Cat. No. 52090a.

Acrotreta lisani Walcott (p. 692).

Figures 3, 3a, and 3b. Top, back, and side views of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52505a.

3c. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52505b.

The specimens represented by figures 3, 3a–c are from Locality **C22**, Middle Cambrian, Changhia limestone, at Changhia, Shantung, China.



FRANCES WIESER DEL.

PLATE LXIX.

PLATE LXIX.

cl. Cardinal scar.
h. Central scar.
s. Median septum or ridge.
vs. Main vascular sinus.

Acrotreta primæva Walcott (p. 700).

Figures 1, 1′, 1″; 1a, 1a′, 1a″; and 1b, 1b′, 1b″. Top, side, and back views of three ventral valves. U. S. Nat. Mus. Cat. Nos. 15343a, 15342a, and 15342b, respectively. The type specimen, represented by figure 1, was figured by Walcott [1886b, Pl. VIII, figs. 1 and 1a] as *Acrotreta gemma*. These figures have been repeatedly copied (see p. 700).

1c. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 15343b. Specimen figured by Walcott [1886b, Pl. VIII, fig. 1b] as *Acrotreta gemma*. This figure has been repeatedly copied (see p. 700).

1d. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 15342c.

1e, 1e′, and 1e″. Top, side, and back views of a cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 15342d.

1f. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52061a.

The specimens represented are all from Locality **31a**, Lower Cambrian limestone near Pioche, Nevada.

Acrotreta pyxidicula White (p. 701).

Figure 2. Dorsal valve from Locality **313f**, Upper Cambrian limestone at Schellbourne, Nevada. U. S. Nat. Mus. Cat. No. 8570a. Specimen figured by White [1877, Pl. III, figs. 3a–b(?)].

2a and 2b. Exterior and outline of convexity of two dorsal valves from Locality **4h**, Middle Cambrian limestone 4 miles east-northeast of Logan, Gallatin County, Montana. U. S. Nat. Mus. Cat. Nos. 52149a and 52149b, respectively.

2c, 2c′, 2c″; 2d, 2d′, 2d″; and 2e, 2e′, 2e″. Top, side, and back views of three ventral valves associated with the dorsal valves represented by figures 2a and 2b. U. S. Nat. Mus. Cat. Nos. 52149c, 52149d, and 52149e, respectively.

2f, 2f′, and 2f″. Top, side, and back views of a ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 8570b. Type specimen, figured by White [1877, Pl. III, figs. 3c and 3d (?)].

3, 3′, and 3″. Top, side, and back views of ventral valve from Locality **5b**, Middle Cambrian Langston limestone, 2 miles southeast of Malade, Oneida County, Idaho. U. S. Nat. Mus. Cat. No. 52147a.

3a, 3a′, and 3a″. Top, side, and back views of cast of the interior of a ventral valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52147b.

3b. Top and side views of cast of the interior of a dorsal valve associated with the specimen represented by figure 3, in which the median ridge is slightly developed. U. S. Nat. Mus. Cat. No. 52147c.

3c and 3c′. Top, side, and back views of cast of the interior of a dorsal valve associated with the specimen represented by figure 3, showing strong median ridge and central and cardinal scars. U. S. Nat. Mus. Cat. No. 52147d.

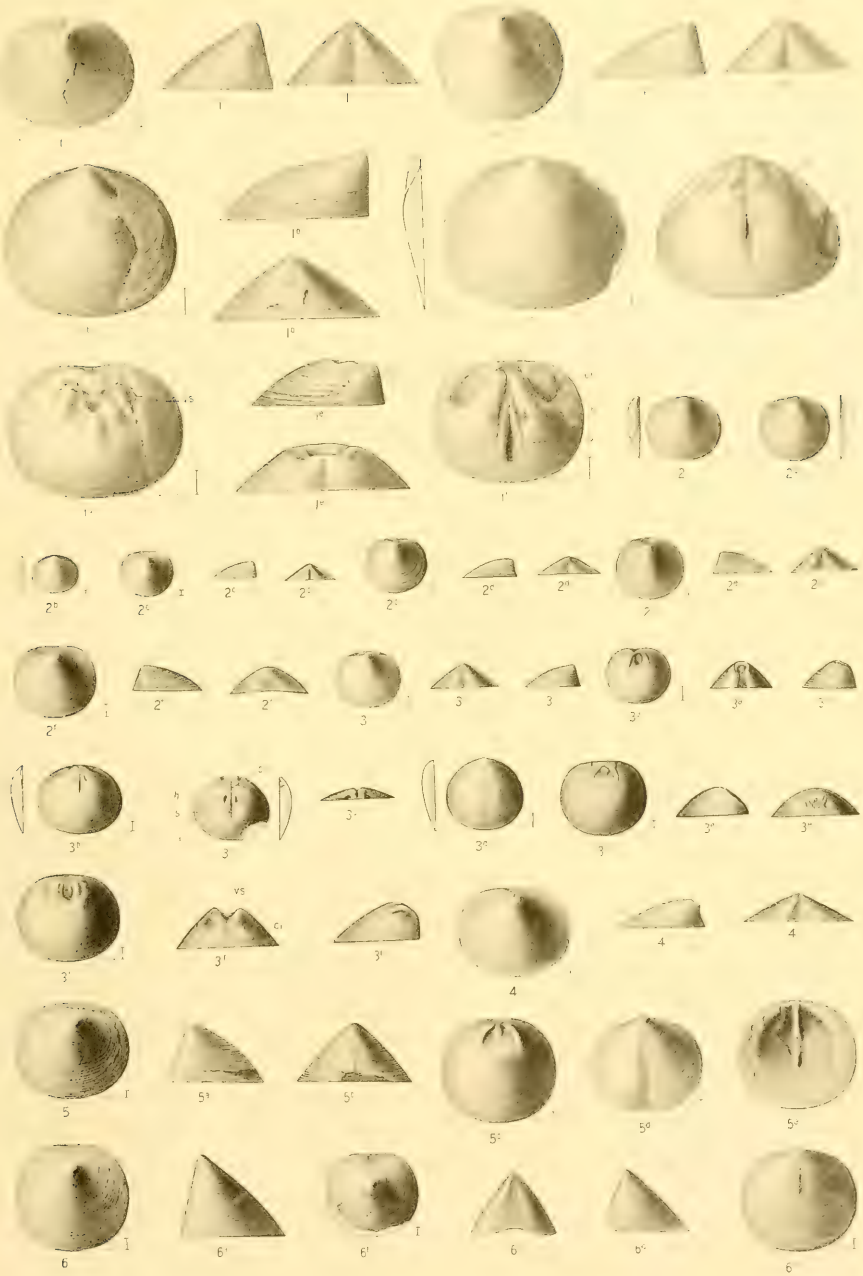
3d. Exterior and side outline of convexity of a dorsal valve from Locality **322**, Middle Cambrian limestone 15 miles west of Montpelier, Idaho. U. S. Nat. Mus. Cat. No. 52150a.

3e, 3e′, and 3e″. Top, side, and back views of a cast of the interior of a ventral valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52147e.

3f, 3f′, and 3f″. Top, side, and back views of the interior of a ventral valve associated with the specimen represented by figure 3d. U. S. Nat. Mus. Cat. No. 52150b.

Acrotreta signalis Walcott (p. 711).

Figures 4, 4′, and 4″. Top, side, and back views of a ventral valve, the type specimen, from Locality **328e**, Middle Cambrian sandstone at St. Croix Falls, Polk County, Wisconsin. The foraminal aperture of 4″ is restored from a second specimen. U. S. Nat. Mus. Cat. No. 35285a.



FRANCES WIESER DEL.

Acrotreta shantungensis Walcott (p. 710).

Figures 5, 5a, and 5b. Top, side, and back views of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52512a.

5c. Top view of a ventral valve with the apex broken off. U. S. Nat. Mus. Cat. No. 52512b.

5d. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52512c.

5e. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52512d.

The specimens represented are all from Locality **C62**, Middle Cambrian limestone 2.5 miles south of Yenchuang, Sintai district, Shantung, China.

Acrotreta pacifica Walcott (p. 699).

Figures 6 and 6a. Top and side views of an elevated ventral valve, the type specimen, from Locality **C5**, Middle Cambrian limestone 3.2 miles southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52506a.

6b, 6c, and 6d. Top, back, and side views of a ventral valve with pointed apex, associated with the specimen represented by figures 6 and 6a. U. S. Nat. Mus. Cat. No. 52506b.

6e. Partly exfoliated dorsal valve from Locality **C2**, Middle Cambrian limestone 2 miles south of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52508a.

PLATE LXX.

PLATE LXX.

cl. Cardinal scar.
h. Central scar.
s. Median septum or ridge.
vs. Main vascular sinus.
x. Cast of foraminal aperture.

Acrotreta schmalenseei Walcott (p. 709).

Figures 1, 1′, and 1″. Top, back, and side views of ventral valve. U. S. Nat. Mus. Cat. No. 18203t.

1a, 1a′, 1a″; 1b, 1b′, 1b″; 1c, 1c′, 1c″; and 1d, 1d′, 1d″. Top, side, and back views of typical forms of the ventral valve. U. S. Nat. Mus. Cat. Nos. 18203a–d, respectively. Figure 1a represents the type specimen.

1e, 1e′, 1e″; 1f, 1f′, 1f″; 1g, 1g′, 1g″; 1h, 1h′, 1h″; and 1i, 1i′, 1i″. Top, side, and back views of casts of the interior of ventral valves. U. S. Nat. Mus. Cat. Nos. 18203e–i, respectively.

1j, 1j′, 1j″; 1k, 1k′, 1k″; 1l, 1l′, 1l″; 1m, 1m′, 1m″; 1n, 1n′, 1n″; and 1o, 1o′, 1o″. Top, side, and back views of casts of the interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 18203j–o, respectively.

1p. Cast of the interior of a dorsal valve with a small and short median ridge. U. S. Nat. Mus. Cat. No. 18203p.

1q and 1r. Exteriors and side outlines of two dorsal valves. U. S. Nat. Mus. Cat. Nos. 18203q and 18203r, respectively.

1s, 1s′, and 1s″. Top, back, and side views of the cast of a ventral valve in which the interior vascular markings are unusually faint for this species. U. S. Nat. Mus. Cat. No. 18203s.

The specimens represented by figures 1, 1a–s are from Locality **8w**, Middle Cambrian limestone of the *Paradoxides forchhammeri* zone at Andrarum, Province of Christianstad, Sweden.

Acrotreta eggegrundensis Wiman (p. 684).

Figures 2a, 2b, and 2c. Top, side, and back views of a ventral valve from Locality **311**, Middle? Cambrian sandstone bowlder No. 3, on Eggegrund Island, Gefle Bay, Sweden. Type specimen in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 57099a). Specimen figured in corresponding positions by Wiman [1902, Pl. II, figs. 29, 27, and 26, respectively].

2d. Dorsal valve associated with the ventral valve represented by figures 2a–c. Original in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 57099b). Specimen figured by Wiman [1902, Pl. II, fig. 24].

Acrotreta uplandica Wiman (p. 714).

Figures 3, 3a and 3b. Top, side, and back views of the type specimen, a ventral valve, from Locality **311b**, Middle? Cambrian sandstone bowlder No. 2 on Biludden, near Gefle, Sweden. Original in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 57100a).

3c. Dorsal valve associated with the specimen represented by figures 3, 3a–b. Original in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 57100b).

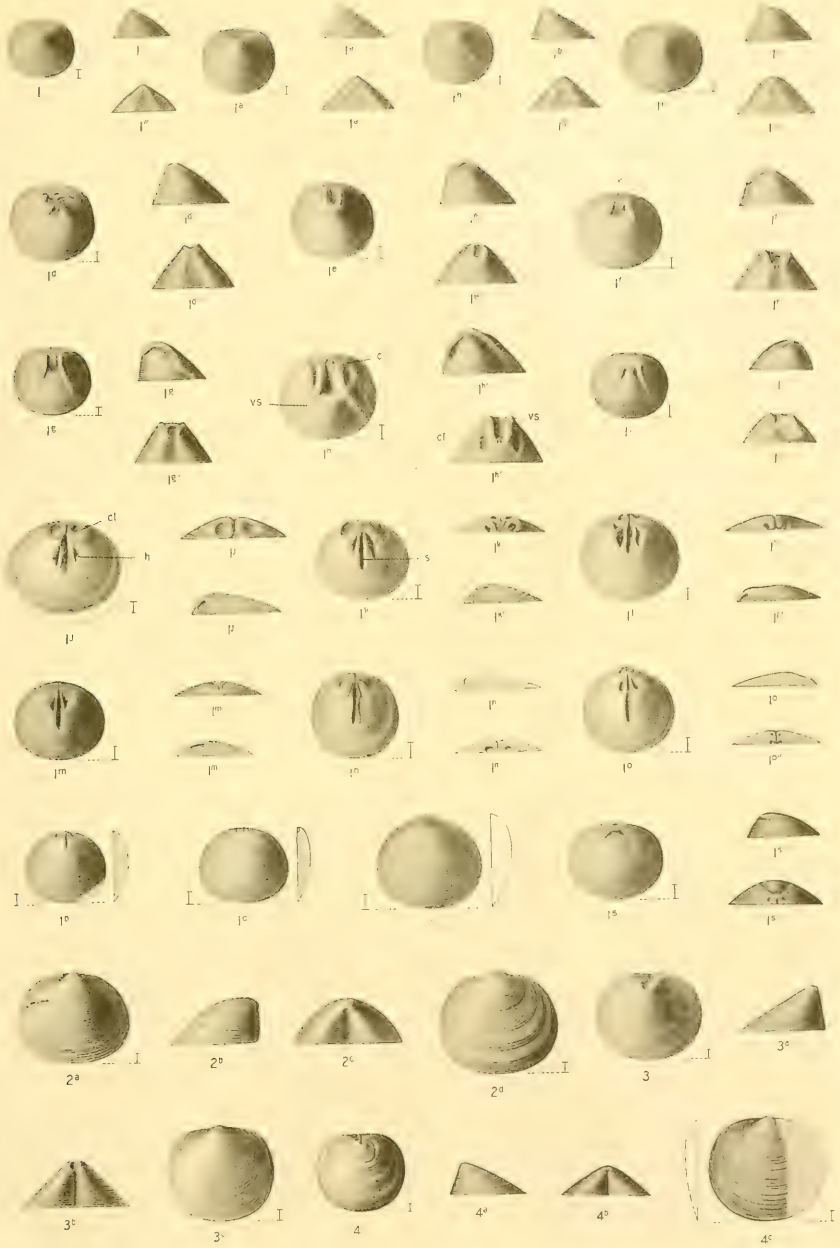
Figures 3, 3a–c are redrawn from the specimens figured by Wiman [1902, Pl. II, figs. 15–18, respectively].

Acrotreta uplandica limöensis (Wiman) (p. 714).

Figures 4, 4a, and 4b. Top, side, and back views of the type specimen, a ventral valve, from Locality **311n**, Middle? Cambrian sandstone bowlder No. 6 on Limön Island, Gefle Bay, Sweden. Original in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 57101a).

4c. Dorsal valve associated with the specimen represented by figures 4, 4a–b. Original in the collection of the University of Upsala; cast in the United States National Museum (Cat. No. 57101b).

Figures 4, 4a–c are redrawn from the specimens figured by Wiman [1902, Pl. II, figs. 19–22] as *Acrotreta limöensis*.



FRANCES WIESER DEL.

PLATE LXXI.

PLATE LXXI.

cl. Cardinal scar.
fa. False area.
h. Central scar.
s. Median septum.
v. Visceral area.
vs. Main vascular sinus.
x′. Cast of foraminal aperture.
x″. Cast of apical callosity.

Acrotreta sagittalis taconica (Walcott) (p. 707).

Figures 1, 1′, and 1″. Top, side, and back views of a ventral valve from Locality **37b**, Lower Cambrian limestone east of Salem, Washington County, New York. U. S. Nat. Mus. Cat. No. 52161a.

1a, 1a′, and 1a″. Interior of ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52161b.

1b, 1b′, 1b″, and 1c, 1c′, 1c″. Top, back, and side views of casts of the interior of ventral valves from Locality **38a**, Lower Cambrian limestone south of North Granville, Washington County, New York. U. S. Nat. Mus. Cat. Nos. 52163a and 52163b, respectively. The type specimen, represented by figure 1c, was figured by Walcott [1887, Pl. I, fig. 18b].

1d, 1d′, and 1d″. Interior of a ventral valve from Locality **44a**, Lower Cambrian limestone on Valatie Kill, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 52165a.

1e, 1e′, and 1e″. Interior of a ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52161c.

1f. Dorsal valve from Locality **36b**, Lower Cambrian limestone near Greenwich, Washington County, New York. U. S. Nat. Mus. Cat. No. 52166a.

1g. Exterior and outline of convexity of dorsal valve from Locality 22, Lower Cambrian limestone near North Granville, Washington County, New York. U. S. Nat. Mus. Cat. No. 52164a.

1h. Exterior and outline of convexity of dorsal valve from Locality **36**, Lower Cambrian limestone south of Shushan, Washington County, New York. U. S. Nat. Mus. Cat. No. 17441a. Specimen figured by Walcott [1887, Pl. I, fig. 18c].

1i and 1j. Casts of the interior and outline of convexity of dorsal valves associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 52161d and 52161e, respectively.

1k. Interior of a dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52161f.

1l, 1l′, and 1m, 1m′. Casts of the interior, with back view and outline of convexity, of two dorsal valves associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 52161g and 52161h, respectively.

1n. Cast of the interior and outline of convexity of dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52161i.

1o. Interior of a ventral valve from Locality **34**, Lower Cambrian limestone at Low Hampton, Washington County, New York, showing the apical callosity and fine grooves radiating forward from it. U. S. Nat. Mus. Cat. No. 52162b. Another specimen (Cat. No. 52163c, Locality **38a**) was used to restore certain portions of this figure. Specimen figured by Walcott [1887, Pl. I, fig. 18a].

Acrotreta sagittalis (Salter) (p. 704).

Figures 2, 2′, 2″; 2a, 2a′, 2a″; 2b, 2b′, 2b″; and 2c, 2c′, 2c″. Top, side, and back views of casts of the interior of four ventral valves from Locality **8w**, Middle Cambrian limestones at Andrarum, Province of Christianstad, Sweden. U. S. Nat. Mus. Cat. Nos. 52156a, 52156b, 52156c, and 52156d, respectively.

2d, 2d′, and 2f, 2f′. Top and back views of two dorsal valves from Locality **6i**, Middle Cambrian limestone near Fosters Point, Random Sound, Newfoundland. U. S. Nat. Mus. Cat. Nos. 52152a and 52152b, respectively.

2e and 2e′. Top and back views of dorsal valve from Locality **2s**, Middle Cambrian limestones at Hastings Cove, Kennebecasis Bay, St. John County, New Brunswick. Museum?.

2g. Back view of ventral valve. From Borregaard, Bornholm, Denmark (horizon unknown). Copenhagen University Museum.

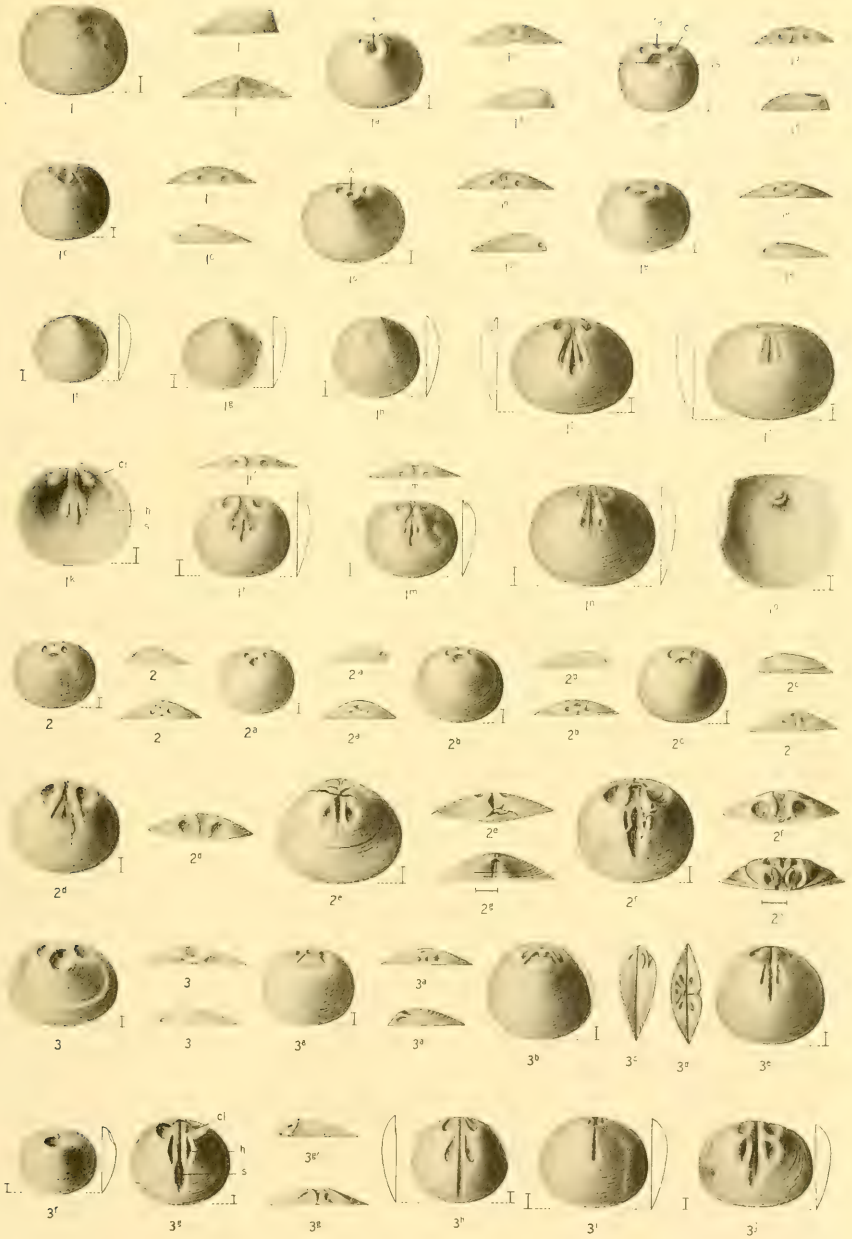
2h. Back view of cast of dorsal valve. From Borregaard, Bornholm, Denmark (horizon unknown). Copenhagen University Museum.

3, 3′, 3″, and 3a, 3a′, 3a″. Top, back, and side views of casts of the interior of ventral valves from Locality **318g**, Middle Cambrian shales near St. Davids, South Wales. U. S. Nat. Mus. Cat. Nos. 52155a and 52155b, respectively.

3b, 3c, 3d, and 3e. Ventral, side, back, and dorsal views of a cast of the two valves united from Locality **8w**, Middle Cambrian limestones at Andrarum, Sweden. U. S. Nat. Mus. Cat. No. 52156e.

3f. Cast of a ventral valve with truncated apex, associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52155c.

3g, 3g′, 3g″, and 3h, 3i, and 3j. Casts of the interior of four dorsal valves, with outlines of convexity. Associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. Nos. 52155d, 52155e, 52155f, and 52155g, respectively.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE LXXII.

PLATE LXXII.

cl. Cardinal scar.
fa. False area.
h. Central scar.
s. Median septum or ridge.
v. Visceral area.
vs. Main vascular sinus.
x′. Cast of foraminal aperture.
x″. Cast of apical callosity.

Acrotreta sagittalis transversa (Hartt) (p. 708).

Figures 1, 1′, 1″; 1a, 1a′, 1a″; and 1b. Top, side, and back views of casts of interior of three ventral valves. U. S. Nat. Mus. Cat. Nos. 52160a, 52160b, and 52160c, respectively.

1c. A ventral valve with a portion of the outer shell. U. S. Nat. Mus. Cat. No. 52160d.

1d and 1d′. Cast of the interior of dorsal valve, with side view. U. S. Nat. Mus. Cat. No. 52160e.

1e. 1e′, 1e″; 1f, 1f′, 1f″; and 1g, 1g′, 1g″. Top, back, and side views of casts of interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52160f, 52160g, and 52160h, respectively.

1h, 1i, and 1j. Side, dorsal, and back views of a cast of the two valves. U. S. Nat. Mus. Cat. No. 52160i.

1k. Interior of a dorsal valve pressed down on a ventral valve. U. S. Nat. Mus. Cat. No. 52160j.

The specimens represented are all from Locality **3**, Upper Cambrian shaly limestone 300 feet (91.4 m.) above the *Paradoxides* zone, Manuels Brook, Conception Bay, Newfoundland.

Acrotreta misera (Billings) (p. 695).

Figures 2, 2′, and 2″. Top, side, and back views of cast of ventral valve. U. S. Nat. Mus. Cat. No. 52128m.

2a, 2a′, 2a″; 2b, 2b′, 2b″; 2c, 2c′, 2c″; and 2d, 2d′, 2d″. Top, side, and back views of casts of ventral valves. U. S. Nat. Mus. Cat. Nos. 52128a–d, respectively.

2e, 2e′, and 2e″. Top, side, and back views of exterior of ventral valve. U. S. Nat. Mus. Cat. No. 52128e.

2f and 2g. Exterior and outline of convexity of two dorsal valves. U. S. Nat. Mus. Cat. Nos. 52128f and 52128g, respectively.

2h. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52128h.

2i, 2i′, 2i″; 2j, 2j′, 2j″; 2k, 2k′, 2k″; and 2l, 2l′, 2l″. Top, side, and back views of casts of the interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52128i–l, respectively.

The specimens represented are all from Locality **1**, Middle Cambrian, shales of zone A of No. 7 of the Manuels Brook section [Walcott, 1891b, p. 261], Manuels Brook, Conception Bay, Newfoundland.

FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE LXXIII.

PLATE LXXIII.

cl. Cardinal scar.
fa. False area.
fp. False pedicle groove.
h. Central scar.
s. Median septum.
vs. Main vascular sinus.
x′. Cast of foraminal aperture.
x″. Cast of apical callosity.

Acrotreta nicholsoni Davidson (p. 696).

[Pl. LXXIII, figs. 6, 6a–b.]

Figure 1. Top and side views of a compressed ventral valve, the type specimen. Copied from Davidson [1868, Pl. XVI, fig. 14].

1a and 1b. Compressed ventral valves. Copied from Davidson [1871, Pl. XLIX, figs. 38 and 39, respectively].

1c. Exterior of dorsal valve. Copied from Davidson [1868, Pl. XVI, fig. 15].

1d. Interior of dorsal valve. Copied from Davidson [1868, Pl. XVI, fig. 16].

The specimens represented by figures 1, 1a–d are from Locality **316**, Lower Ordovician, Upper Llandeilo? "Black shales" at Dobbs Linn, near Moffat, in Dumfriesshire, Scotland.

Figures 1e, 1f, and 1g. Front, side, and back views of ventral valve, from Locality **316a**, Lower Ordovician, Llandeilo, at Craighead, Girvan district, Ayrshire, Scotland.

1h and 1i. Back and front views of a ventral valve, from Locality **316a**, Lower Ordovician, Llandeilo, at Balcletchie, Girvan district, Ayrshire, Scotland.

1j. Exterior of the dorsal valve attached to the specimen represented by figures 1e, 1f, and 1g.

1k. Exterior of the dorsal valve attached to the specimen represented by figures 1h and 1i.

Figures 1e–k are copied from Davidson [1883, Pl. XVI, figs. 21a, 21c, 21b, 22a, 22b, 21d, and 22c, respectively].

Acrotreta subconica Kutorga (p. 713).

Figures 2, 2a–d. Ventral and dorsal valves. Copied from Kutorga [1848, Pl. VII, figs. 7a, 7b, 7c, 7b′, and 7c′, respectively]. The specimens represented by figures 2, 2c, and 2d are redrawn in figures 2e, 2h, and 2i, respectively, of this plate.

2e. Ventral valve. Specimen figured by Kutorga [1848, Pl. VII, fig. 7a]. (See fig. 2.)

2f and 2g. Side and posterior views of the type specimen in Kutorga's collection preserving both ventral and dorsal valves. The dorsal valve shown in these figures is the one figured by Kutorga [1848, Pl. VII, fig. 7c′]. A top view of it is given in figure 2i.

2h. Posterior view of a ventral valve showing the median groove and pedicle aperture. Specimen figured by Kutorga [1848, Pl. VII, fig. 7b′]. (See fig. 2c.)

2i. Dorsal valve shown in side outline by figures 2f and 2g. Specimen figured by Kutorga [1848, Pl. VII, fig. 7c′]. (See fig. 2d.)

The specimens represented are from Locality **336**, Ordovician, *Echinosphærites* limestone, horizon Cl$_3$, at Popowka, near St. Petersburg, Russia.

Acrotreta socialis von Seebach (p. 711).

Figures 3 and 3a. Side and back views of ventral valve, the type specimen.

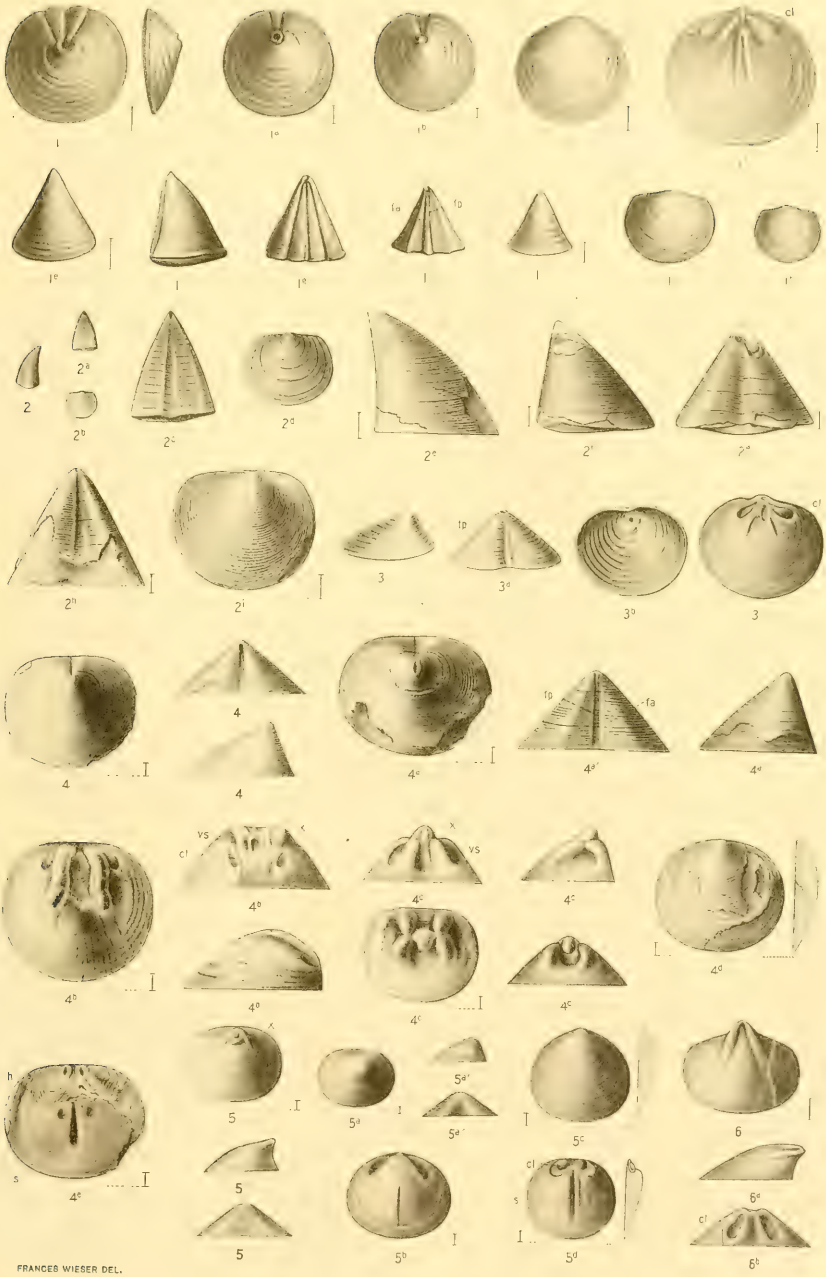
3b. Interior of ventral valve.

3c. Cast of dorsal valve.

The specimens represented by figures 3, 3a–c are from Locality **334g**, Middle Cambrian, Bornholm Island, Denmark. The figures are copied from von Seebach [1865, Pl. VIIIa, figs. 1–4, respectively].

Figures 4 4′, 4″, and 4a, 4a′, 4a″. Top, back, and side views of two ventral valves from Locality **8z**, Middle Cambrian limestones of the *Paradoxides œlandicus* zone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. Nos. 35286a and 35286b, respectively.

4b, 4b′, and 4b″. Top, back, and side views of a cast of part of the interior of a ventral valve from Locality **8w**, Middle Cambrian limestones of the *Paradoxides forchhammeri* zone at Andrarum, 20 miles (32 km.) northwest of Simrishamn, Province of Christianstad, Sweden. U. S. Nat. Mus. Cat. No. 52174a.



FRANCES WIESER DEL.

ACROTRETA SOCIALIS von Seebach—Continued.

FIGURES 4c, 4c′, 4c″, and 4c‴. Top, back, side, and front views of a cast of the interior of a ventral valve, showing very strong cardinal scars and main vascular sinuses, associated with the shells represented by figures 4 and 4a. U. S. Nat. Mus. Cat. No. 35286c.

4d. Exterior and side views of a dorsal valve associated with the shells represented by figures 4 and 4a. U. S. Nat. Mus. Cat. No. 35286d.

4e. Cast of the interior of dorsal valve associated with the shells represented by figures 4 and 4a. U. S. Nat. Mus. Cat. No. 35286e.

ACROTRETA SABRINÆ (Callaway) (p. 702).

FIGURES 5, 5′, and 5″. Top, side, and back views of a cast of part of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 57102a.

5a, 5a′, and 5a″. Top, side, and back views of a partly compressed ventral valve. U. S. Nat. Mus. Cat. No. 57102b.

5b. Cast of the interior of a dorsal valve. Type specimen, figured by Callaway [1877, Pl. XXIV, fig. 12] as *Obolella sabrinæ*. Collection of Dr. Charles Lapworth.

5c. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 57102c.

5d. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 57102d.

The specimens represented are all from Locality **304h**, Upper? Cambrian Shineton shales, Mary Dingle, South Shropshire, England.

ACROTRETA NICHOLSONI Davidson (p. 696).

[Pl. LXXIII, figs. 1, 1a–k.]

FIGURES 6, 6a, and 6b. Top, side, and back views of cast of ventral valve from Locality **304h**, Upper? Cambrian Shineton shales, Mary Dingle, South Shropshire, England. U. S. Nat. Mus. Cat. No. 52131a.

PLATE LXXIV.

PLATE LXXIV.

a. Area.
cl. Cardinal scar.
h. Central scar.
s. Median septum.
v. Visceral area.
vs. Main vascular sinus.
x″. Cast of apical callosity.

Acrotreta ophirensis Walcott (p. 697).

Figures 1, 1′, and 1″. Top, side, and back views of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35281q.

1a, 1a′, 1a″; 1b, 1b′, 1b″; and 1c, 1c′, 1c″. Top, side, and back views of ventral valves that illustrate variation in form. U. S. Nat. Mus. Cat. Nos. 35281a–c, respectively.

1d, 1d′, and 1d″. Top, back, and side views of cast of interior of a ventral valve. U. S. Nat. Mus. Cat. No. 35281d.

1e. Cast of the interior of a ventral valve, showing outlines of visceral cavity. U. S. Nat. Mus. Cat. No. 35281e.

1f. Interior of ventral valve with area preserved. U. S. Nat. Mus. Cat. No. 35281f.

1g. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35281g.

1h. Cast of part of the interior of a dorsal valve broadened by distortion. U. S. Nat. Mus. Cat. No. 35281h.

1i. Cast of the interior of a dorsal valve narrowed by distortion. U. S. Nat. Mus. Cat. No. 35281i.

1j, 1j′, and 1j″. Top, side, and back views of exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 35281j.

1k and 1k′. Top and side views of a dorsal valve. U. S. Nat. Mus. Cat. No. 35281k.

1l. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35281l.

1m, 1m′, 1m″, and 1n, 1n′, 1n″. Top, side, and back views of casts of interior of elongated dorsal valves. U. S. Nat. Mus. Cat. Nos. 35281m and 35281n, respectively.

1o. Interior of a finely preserved dorsal valve. U. S. Nat. Mus. Cat. No. 35281o.

1p. Cast of the interior of an undistorted dorsal valve. U. S. Nat. Mus. Cat. No. 35281p.

The specimens represented are all from Locality **3e**, Middle Cambrian limestone less than 400 feet (121.9 m.) above the quartzitic sandstones, at Ophir, Oquirrh Range, Tooele County, Utah.

Acrotreta ophirensis rugosa Walcott (p. 699).

Figure 2. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 35282a.

2a and 2a′. Top and side views of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35282b.

2b and 2b′. Top and side views of a cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 35282c.

2c and 2c′. Top and side views of a dorsal valve. U. S. Nat. Mus. Cat. No. 35282d.

2d. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35282e.

2e. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35282f.

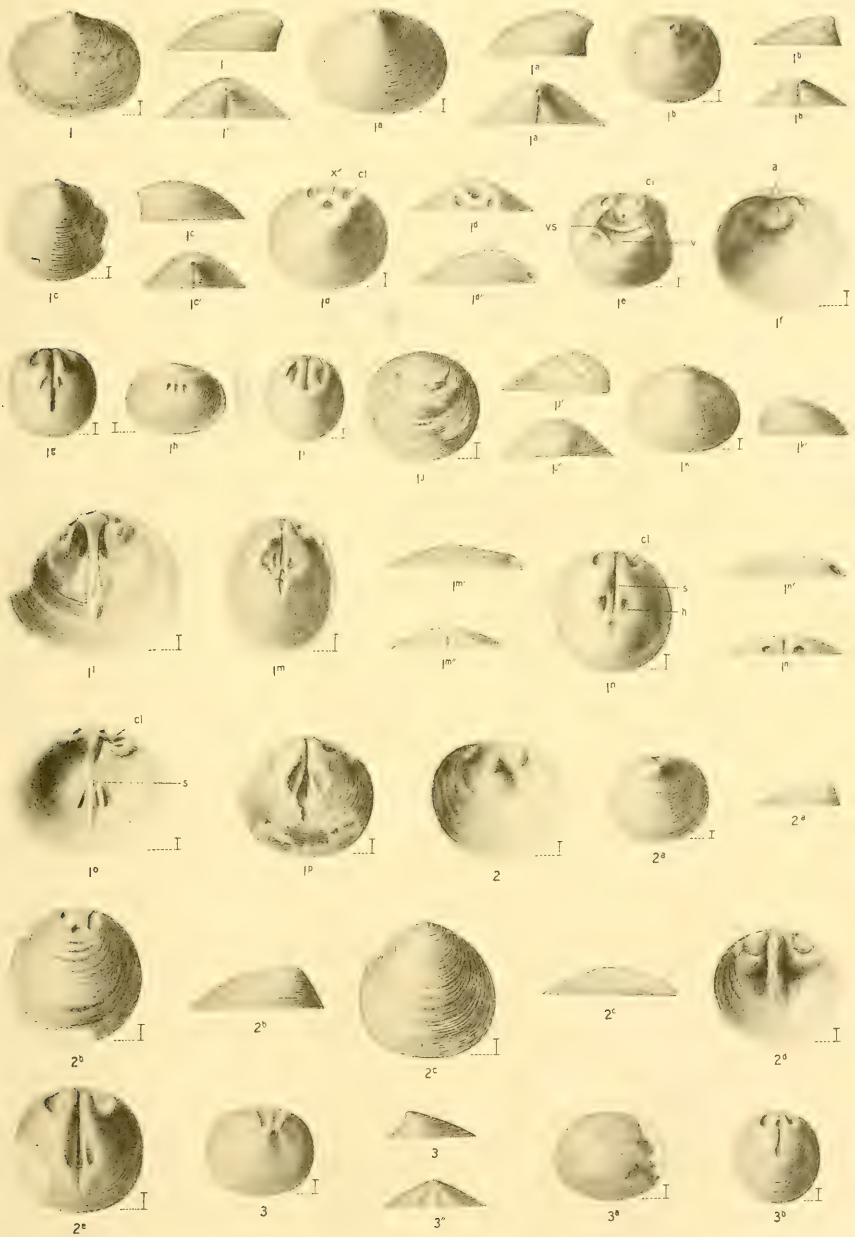
The specimens represented are all from Locality **3e**, Middle Cambrian limestone less than 400 feet (121.9 m.) above the quartzitic sandstones, at Ophir, Oquirrh Range, Tooele County, Utah.

Acrotreta claytoni Walcott (p. 680).

Figures 3, 3′, and 3″. Top, side, and back views of a ventral valve from Locality **175**, Lower Cambrian shales on the divide between Clayton and Fish Lake valleys, about 15 miles (24.2 km.) south-southwest of the town of Silver Peak, Silver Peak quadrangle (U. S. Geol. Survey), Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 52080a. This is the type specimen.

3a. Partly exfoliated dorsal valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52080b.

3b. Cast of interior of a distorted ventral valve from Locality **11**, Lower Cambrian limestones of No. 3 of the Silver Peak group [Walcott, 1908f, p. 189], about 2.5 miles (4 km.) south of Barrel Spring, and 0.5 mile (0.8 km.) east of the road, in the extreme southeastern corner of the Silver Peak quadrangle (U. S. Geol. Survey), Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 52081a.



FRANCES WIESER DEL.

PLATE LXXV.

PLATE LXXV.

Acrotreta rudis Walcott (p. 702).

[Pl. LXV, fig. 3f.]

Figure 1. Enlargement by photography of a small piece of arenaceous shale on which the casts of three ventral and three dorsal valves have been compressed. The ventral valves are crushed and spread out toward the aperture. Locality **121**, Middle Cambrian Rogersville shale, road just east of Harlan Knob, 4 miles (6.4 km.) northeast of Rogersville [Keith, 1905, areal geology sheet], Hawkins County, Tennessee. U. S. Nat. Mus. Cat. No. 52112a.

Acrotreta conula Walcott (p. 681).

Figure 2. Enlargement by photography of a fragment of shale studded with shells of this species. Locality **310a**, Upper Cambrian shales of *Olenus truncatus* zone, on Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 35267a.

2a. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 35267a.

2b. A vertically compressed ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35267a.

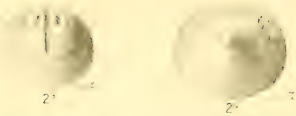
Figure 2a is drawn from the specimen which is partly cut by the lower margin of figure 2, just to the left of the center. Figure 2b is of a specimen from the same slab of shale but outside the limits of figure 2.

Acrothyra proavia (Matthew) (p. 717).

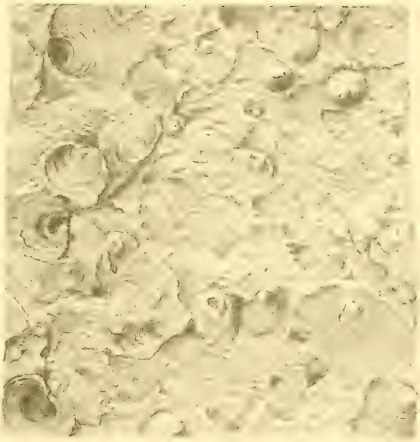
[Pl. LXXVI, figs. 3, 3a–u.]

Figure 3. Enlargement by photography of a small piece of limestone in which numerous ventral and dorsal valves are embedded. The varying shape of the ventral valves is well illustrated. Locality **10q**, Middle Cambrian sandstone below the waterfall in Division E2b of Matthew's [1903, p. 21] Etcheminian, Dugald Brook, Indian River, eastern Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52052r.

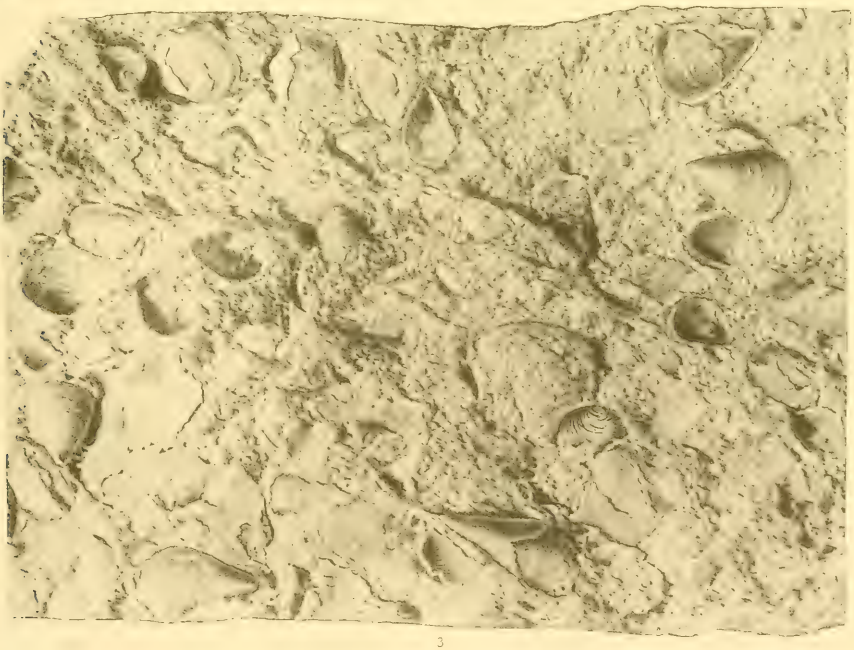
1



2' 2'



2



3

FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE LXXVI.

PLATE LXXVI.

cl. Cardinal scar.
fp. False pedicle groove.
s. Median septum or ridge.
v. Visceral area.
vs. Main vascular sinus.
x. Foraminal aperture.
x′. Cast of foraminal tube.
x″. Cast of apical callosity.

Acrotreta inflata (Matthew) (p. 690).

Figures 1 and 1′. Top and side views of an unusually well-preserved ventral valve, showing radiating lines on inner lamellæ of the shell. Locality **2f**, Middle Cambrian sandstones of Division 1b1 of Matthew's [1895, p. 108] *Protolenus* zone, Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 35276a.

1a and 1a′. Top and side views of an elevated ventral valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 35276b.

1b and 1b′. Top and side views of a ventral valve associated with the specimen represented by figure 1, with the apex broken off so as to show the cast of the large apical callosity and the base of the small foraminal tube. U. S. Nat. Mus. Cat. No. 35276c.

1c, 1c′, and 1c″. Top, side, and back views of a partly exfoliated ventral valve associated with the specimen represented by figure 1, showing cast of the large cardinal muscle scars and apical callosity. U. S. Nat. Mus. Cat. No. 35276d.

1d and 1d′. Top and side views of a ventral valve in which the false area slopes forward. Middle Cambrian sandstones of Division 1b1 (the general horizon of localities **2f** and **2g**) on Hanford Brook, St. John County, New Brunswick. University of Toronto, Canada. (See figure 1g for back view.)

1e and 1e′. Top and side views of a broad ventral valve from Locality **2g**, Middle Cambrian, in sandstones of Division 1b1 of Matthew on Hanford Brook, St. John County, New Brunswick, preserving the foraminal aperture. U. S. Nat. Mus. Cat. No. 35276e.

1f, 1f′, and 1f″. Top, side, and back views of a specimen with a relatively small apical callosity and vertical false area. Middle Cambrian sandstones of Division 1b1 (the general horizon of localities **2f** and **2g**) on Hanford Brook, St. John County, New Brunswick. University of Toronto, Canada.

1g. Back view of specimen represented by figure 1d, with upper portion restored from another specimen.

1h. Cast of an elongate dorsal valve associated with the shell represented by figure 1. U. S. Nat. Mus. Cat. No. 35276f.

1i. Partly exfoliated dorsal valve associated with the specimen represented by figure 1e. U. S. Nat. Mus. Cat. No. 35276g.

1k and 1k′. Top and back views of cast of dorsal valve associated with the specimen represented by figure 1e, showing large cardinal scars and strong median ridge. U. S. Nat. Mus. Cat. No. 35276h.

2. Ventral valve from the same general horizon as that of localities **2f** and **2g**, Middle Cambrian sandstones of Division 1b1 on Hanford Brook, St. John County, New Brunswick. University of Toronto, Canada. Drawn from the type specimen of the species; it was figured by Matthew [1886, Pl. V, figs. 7 and 7a] as *Lingulella? inflata*.

2a. Ventral valve associated with the specimen represented by figure 2. University of Toronto, Canada. Specimen figured by Matthew [1895a, Pl. V, figs. 4a–c] as *Lingulella? inflata ovalis*.

Acrothyra proavia (Matthew) (p. 717).

[Pl. LXXV, fig. 3.]

Figure 3. Slender, elongate ventral valve from Locality **131**, Middle Cambrian shaly sandstones of E3a of Matthew's Etcheminian, Dugald Brook, Cape Breton, Nova Scotia. University of Toronto, Canada. This specimen was first illustrated by Matthew [1901b, fig. 1, p. 303] as *Acrothyra proavia prima*.

3a and 3a′. Top and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 52052a.

3b. A broader form of the ventral valve than that shown by figure 3. U. S. Nat. Mus. Cat. No. 52052b.

3c. A ventral valve associated with specimen represented by figure 3. University of Toronto, Canada.

3d, 3d′, and 3d″. Top, back, and side views of a ventral valve with the apex broken off. Labeled "*A. proavia* var.;" it is probably the variety "*crassa*" Matthew. University of Toronto, Canada. Horizon and locality unknown.

3e and 3e′. Top and side views of a broad ventral valve; this probably represents the form for which Matthew proposed the variety *crassa*. U. S. Nat. Mus. Cat. No. 52052c.

FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

ACROTHYRA PROAVIA (Matthew)—Continued.

FIGURE 3f. Ventral valve. U. S. Nat. Mus. Cat. No. 52052d.

3g. Posterior view of false area of a specimen associated with the specimen represented by figure 3. University of Toronto, Canada.

3h. Posterior view of false area of a much broader shell than that represented by figure 3g. U. S. Nat. Mus. Cat. No. 52052e.

3i, 3k, and 3l. Casts of ventral valves showing cast of visceral cavity. U. S. Nat. Mus. Cat. Nos. 52052f, 52052g, and 52052h, respectively.

3m. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52052i.

3n. Interior of a ventral valve with the apex broken away. U. S. Nat. Mus. Cat. No. 52052j.

3o. Two ventral valves illustrating effect of distortion by compression. U. S. Nat. Mus. Cat. No. 52052k.

3p. Interior of a dorsal valve associated with many specimens of this species, which varies in outline and internal markings from all other specimens. This may be owing to elongation and compression in the matrix. U. S. Nat. Mus. Cat. No. 52052l.

3q. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52052m.

3r and 3s. Casts of interior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52052n and 52052o, respectively.

3t. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52052p.

3u. Exterior and side outline of a dorsal valve. U. S. Nat. Mus. Cat. No. 52052q.

With the exception of figures 3, 3c, 3d, and 3g, all of the specimens represented by figures 3, 3a–u are from Locality **10q**, Middle Cambrian sandstone below the waterfall in Division E2b of Matthew's [1903, p. 21] Etcheminian, Dugald Brook, Indian River, eastern Cape Breton, Nova Scotia.

ACROTHYRA MINOR Walcott (p. 717).

[Text fig. 59, p. 717.]

FIGURES 4 and 4′. Top and side views of a nearly perfect ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52050a.

4a and 4a′. Top and side views of a cast of the interior of a ventral valve that had a large apical callosity. U. S. Nat. Mus. Cat. No. 52050b.

4b, 4b′, and 4b″. Top, back, and side views of a cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52050c.

The specimens represented are all from Locality **5b**, Middle Cambrian Langston limestone near the mouth of Twomile Canyon, 2 miles (3.2 km.) southeast of Malade, Oneida County, Idaho.

PLATE LXXVII.

PLATE LXXVII.

cl. Cardinal scars.
fp. False pedicle groove.
h. Central scars.
s. Median septum.
vs. Main vascular sinus.
x″. Cast of apical callosity.

Acrotreta concentrica Walcott (p. 681).

Figures 1, 1′, and 1″. Top, side, and back views of the exterior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 35266a.

1a and 1a′. Top and side views of a partial cast of the interior of a ventral valve, showing the base of strong vascular sinuses and cardinal scars. U. S. Nat. Mus. Cat. No. 35266b.

1b. Cast of a compressed dorsal valve. U. S. Nat. Mus. Cat. No. 35266c.

The specimens represented are all from Locality **96x**, Middle Cambrian limestone 1 mile (1.6 km.) north of Adairsville, 15 miles (24.2 km.) northwest of Cartersville, Cartersville quadrangle (U. S. Geol. Survey), Bartow County, Georgia.

Acrotreta baileyi Matthew (p. 676).

Figures 2, 2′, and 2″. Top, side, and back views of a slightly distorted ventral valve. Type specimen, figured by Matthew [1886, Pl. V, figs. 13c and 13d]. This specimen has been repeatedly figured; see page 676 for record.

2a. Cast of a distorted dorsal valve. Specimen figured by Matthew [1886, Pl. V, fig. 13]. The specimen has been repeatedly figured; see page 676 for record.

2b and 2c. Casts of the interior of distorted dorsal valves.

2d. Interior of a compressed dorsal valve.

The specimens represented are all from Locality **300**, Middle Cambrian shaly sandstones, possibly of Division 1d of Matthew, on Long Reach, St. John River, Kings County, New Brunswick. They are in the collection of the University of Toronto, Canada.

Acrotreta seebachi Walcott (p. 710).

Figures 3, 3′, and 3″. Top, back, and side views of a cast of the interior of a ventral valve from Locality **8x**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at the cement works at Slemmestad, about 3 miles (4.8 km.) southwest of Christiania, Norway. U. S. Nat. Mus. Cat. No. 52172a. This is the type specimen.

3a, 3a′, and 3a″. Top, side, and back views of the exterior of a ventral valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52172b.

Acrotreta parvula (Wallerius) (p. 699).

Figures 4, 4′, and 4″. Top, back, and side views of ventral valve from Locality **310i**, passage beds between the Middle and Upper Cambrian, in limestone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 35283a.

4a. Exterior of dorsal valve, associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 35283b.

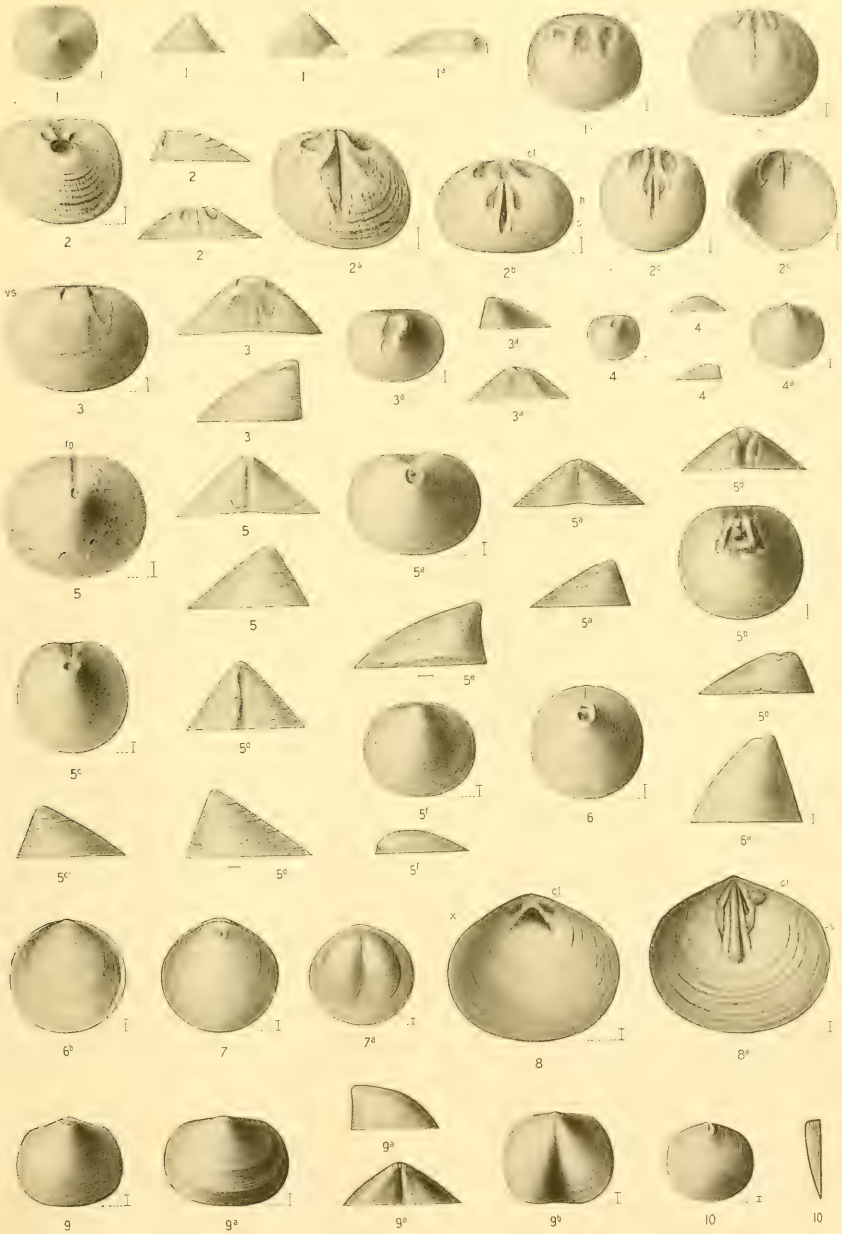
Acrotreta gemmula Matthew (p. 686).

[Pl. LXVI, figs. 3, 3a–c.]

Figures 5, 5′, and 5″. Top, back, and side views of the exterior of a ventral valve from Locality **10p**, Middle Cambrian sandstones of Division E2b of Matthew's Etcheminian on Dugald Brook, Indian River, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52088a.

5a, 5a′, and 5a″. Top, back, and side views of a ventral valve showing the cast of the surface of the apical callosity. Locality **10p″**, Middle Cambrian sandstone on the small brook on the hill between the bridge over Indian River and McPhees Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52088b.

5b, 5b′, and 5b″. Top, back, and side views of a ventral valve associated with the specimen represented by figure 5, showing cast of base of vascular sinuses, surface of apical callosity, and pedicle tube. U. S. Nat. Mus. Cat. No. 52088c.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Acrotreta gemmula Matthew—Continued.

Figures 5c and 5c′. Top and side views of a ventral valve associated with the specimen represented by figure 5, that has a more erect posterior side than most specimens. U. S. Nat. Mus. Cat. No. 52088d.

5d and 5d′. Back and side views of a ventral valve associated with the specimen represented by figure 5, the surface of which has been roughened by the impress of the fine grains of sand in the matrix so that it resembles the surface characteristic of "*Acrotreta papillata*" Matthew=*Acrothyra sera*. U. S. Nat. Mus. Cat. No. 52088e.

5e. Side view of a ventral valve associated with the specimen represented by figure 5, in which the posterior side curves backward as in Matthew's figure of the ventral valve [1903, Pl. III, fig. 4b]. U. S. Nat. Mus. Cat. No. 52088f.

5f and 5f′. Top and side views of the exterior of a dorsal valve associated with the specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 52088g.

Acrotreta babel Barrande (p. 676).

Figures 6 and 6a. Top and side views of a ventral valve, the type specimen, from Locality **303**, Lower Ordovician, Étage d3 at Königshof, Bohemia. Copied from Barrande [1879b, Pl. XCV, figs. VII: 2A and 2B, respectively].

6b. Cast of dorsal valve associated with specimen represented by figures 6 and 6a. Copied from Barrande [1879b, Pl. XCV, fig. VII: 2C].

Acrotreta? minima (Barrande) (p. 695).

Figure 7. Top view of ventral valve, the type specimen, from Locality **303d**, Lower Ordovician, Étage d1 at Swarow, Bohemia.

7a. Cast of dorsal valve associated with the specimen represented by figure 7.

The figures are both copied from Barrande [1879b, Pl. XCV, figs. II: 3A and 1A, respectively], who labeled them "*Obolus? minimus.*"

Acrotreta belti (Davidson) (p. 678).

Figure 8. Cast of the interior of a compressed ventral valve, the type specimen, from Locality **305**, Upper Cambrian Lower Tremadoc shales at Craig-y-dinas, North Wales.

8a. Cast of the interior of a dorsal valve associated with the specimen represented by figure 8.

The figures are both copied from Davidson [1871, Pl. L, figs. 16a and 17a, respectively]. The same specimens were figured by Davidson [1868, Pl. XV, figs. 27a and 26a, respectively], both as *Obolella belti*.

Acrotreta neboensis Walcott (p. 695).

Figure 9. Top view of ventral valve. U. S. Nat. Mus. Cat. No. 52130a.

9a, 9a′, and 9a″. Top, side, and back views of the exterior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52130b.

9b. Exterior of a dorsal valve, showing strong median sinus. U. S. Nat. Mus. Cat. No. 52130c.

The specimens represented are all from Locality **14t**, Middle Cambrian limestone in Mount Nebo Canyon, 3 miles (4.8 km.) southeast of Mona, Juab County, Utah.

Acrotreta nox Walcott (p. 696).

Figures 10 and 10′. Top and side views of a ventral valve, the type specimen, from Locality **10v**, Upper Cambrian shales at Fox Glen, about 8 miles (12.8 km.) east of Baraboo, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. No. 52132a.

PLATE LXXVIII.

PLATE LXXVIII.

ac. Apical callosity.
cl. Cardinal scar.
fa. False area.
fp. False pedicle groove.
h. Central muscle scar.
s. Median septum.
vs. Main vascular sinus.
x″. Cast of apical callosity.

Acrotreta ophirensis descendens Walcott (p. 698).

Figures 1, 1′, and 1″. Top, side, and back views of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52143a. Copied from Walcott [1908d, Pl. IX, figs. 1, 1′, and 1″].

1a. Posterior portion of ventral valve showing apex. U. S. Nat. Mus. Cat. No. 52143d.

1b. Dorsal valve. U. S. Nat. Mus. Cat. No. 52143c.

1c. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52143b. Copied from Walcott [1908d, Pl. IX, fig. 1a].

The specimens represented are all from Locality **30n**, Middle Cambrian limestone in 1c of the Weeks limestone, on the north side of Weeks Canyon, about 4 miles south of Marjum Pass, House Range [Walcott, 1908f, Pl. XIII], Millard County, Utah.

Acrotreta marjumensis Walcott (p. 693).

Figures 2, 2′, and 2″. Top, side, and back views of ventral valve, the type specimen, from Locality **11n**, Middle Cambrian limestone in 1a of the Marjum limestone in the long cliff 2 miles (3.2 km.) southeast of Marjum Pass, House Range, Utah. U. S. Nat. Mus. Cat. No. 52116a. Copied from Walcott [1908d, Pl. IX, figs. 2, 2′, and 2″]. Two specimens, both on the same hand specimen as the shell represented by figure 2, were also used in drawing these figures.

2a. Top view of a nearly circular ventral valve from Locality **33d**, Upper Cambrian limestone at the base of the first high point southwest of the J. J. Thomas ranch, Fish Spring Range, Utah. U. S. Nat. Mus. Cat. No. 52117a.

2b. Broken dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52116c. Another specimen (Cat. No. 52116e) was used to restore certain portions of this figure.

2c. Interior of dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52116b. Copied from Walcott [1908d, Pl. IX, fig. 2a].

2d. Side view of median septum of a dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52116d.

Acrotreta ulrichi Walcott (p. 714).

Figures 3, 3′, and 3″. Top, side, and back views of ventral valve from Locality **12p**, Upper Cambrian limestones of the Reagan sandstone, at the northwest extremity of the Arbuckle Mountains, about 4 miles (6.4 km.) east of Homer, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52180a. Copied from Walcott [1908d, Pl. IX, figs. 3, 3′, and 3″]. This is the type specimen.

Acrotreta bellatula Walcott (p. 677).

Figures 4, 4′, and 4″. Top, side, and back views of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52072a. Copied from Walcott [1908d, Pl. IX, figs. 4, 4′, and 4″].

4a. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52072e.

4b. Portion of interior of ventral valve. U. S. Nat. Mus. Cat. No. 52072b. Copied from Walcott [1908d, Pl. IX, fig. 4a.]

4c. Cast of interior of ventral valve. U. S. Nat. Mus. Cat. No. 52072d.

4d. Cast of interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52072c. Another specimen (catalogue No. 52072f) was used to restore certain portions of this figure. Copied from Walcott [1908d, Pl. IX, fig. 4b].

The specimens represented are all from Locality **10z**, Middle Cambrian limestones in 1a of the Marjum limestone in the long cliff southeast of Marjum Pass [Walcott, 1908f, p. 179, and Pls. XIII and XV], House Range, Utah.

FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Linnarssonella girtyi Walcott (p. 666).

[Pl. LXXIX, figs. 1, 1a-r.]

Figures 5 and 5′. Top and side views of ventral valve from Locality **32t**, Upper Cambrian limestone in Fandango Spring Canyon on the east side of the Dugway Range, about 5 miles (8 km.) north of where the stage road between Vernon and Deep Creek crosses the divide, Tooele County, Utah. U. S. Nat. Mus. Cat. No. 52195a.

5a. Exterior view of dorsal valve associated with the specimen represented by figure 5. U. S. Nat. Mus. Cat. No. 52195b.

Linnarssonella transversa Walcott (p. 670).

Figures 6, 6′, and 6″. Top, side, and back views of ventral valve from Locality **30j**, Upper Cambrian limestone in 1e of the Orr formation on Orr Ridge, about 5 miles (8 km.) south of Marjum Pass [Walcott, 1908f, p. 176 and Pl. XIII], House Range, Utah. U. S. Nat. Mus. Cat. No. 52201a. Figures 6 and 6′ are copied from Walcott [1908d, Pl. IX, figs. 6 and 6′]. This is the type specimen.

6a, 6b, and 6c. Partly exfoliated dorsal valves associated with the specimen represented by figure 6. U. S. Nat. Mus. Cat. Nos. 52201b, 52201c, and 52201d, respectively.

Linnarssonella nitens Walcott (p. 669).

Figures 7, 7′, and 7″. Top, side, and back views of ventral valve from Locality **31t**, Upper Cambrian limestone in 1d of the Orr formation on Orr Ridge, about 5 miles (8 km.) south of Marjum Pass [Walcott 1908f, p. 176 and Pl. XIII], House Range, Utah. U. S. Nat. Mus. Cat. No. 52198a. Figures 7 and 7′ are copied from Walcott [1908d, Pl. IX, figs. 7 and 7′]. This is the type specimen.

7a. Partly exfoliated dorsal valve associated with the specimen represented by figure 7. U. S. Nat. Mus. Cat. No. 52198b.

Linnarssonella modesta Walcott (p. 668).

Figures 8, 8′, and 8″. Top, side, and back views of ventral valve from Locality **31t**, Upper Cambrian limestone in 1d of the Orr formation on Orr Ridge, about 5 miles (8 km.) south of Marjum Pass [Walcott, 1908f, p. 176 and Pl. XIII], House Range, Utah. U. S. Nat. Mus. Cat. No. 53679a. Figures 8 and 8′ are copied from Walcott [1908d, Pl. IX, figs. 8 and 8′].

8a. A more acuminate ventral valve than that represented by figure 8. U. S. Nat. Mus. Cat. No. 52197e.

8b and 8b′. Exterior and back views of a partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 52197b.

8c and 8d. Partly exfoliated ventral valves. U. S. Nat. Mus. Cat. Nos. 52197c and 52197d, respectively.

8e. Interior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52197a. Copied from Walcott [1908d, Pl. IX, fig. 8a].

8f. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52197f.

The specimens represented by figures 8a–f are from Locality **30k**, 25 feet below Locality 31t (fig. 8), at the same place on Orr Ridge.

Linnarssonella urania Walcott (p. 670).

Figure 9. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52202d.

9a, 9a′, and 9a″. Top, side, and back views of a partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 52202a. Figure 9a is copied from Walcott [1908d, Pl. IX, fig. 9]. This is the type specimen.

9b. Interior of ventral valve. U. S. Nat. Mus. Cat. No. 52202c.

9c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52202b. Copied from Walcott [1908d, Pl. IX, fig. 9a].

The specimens represented are all from Locality **55u**, Middle Cambrian limestone 0.25 mile (0.4 km.) below the Maxfield mine, in Big Cottonwood Canyon, on the west side of the Wasatch Mountains, southeast of Salt Lake City, Utah.

PLATE LXXIX.

PLATE LXXIX.

a. Central lateral space of area.
a′. Outer lateral space of area.
cl. Cardinal scar.
f. Flexure line of area.
fa. False area.
h. Central muscle scar.
j. Anterior lateral muscle scar.
s. Median septum or ridge.
v. Visceral area.
vs. Main vascular sinus.
x. Foraminal aperture.
x″. Cast of apical callosity.

Linnarssonella girtyi Walcott (p. 666).

[Pl. LXXVIII, figs. 5, 5a.]

Figure 1. Exterior of ventral valve with side view of same, the type specimen. U. S. Nat. Mus. Cat. No. 35287a.

1a, 1a′, and 1a″. Exterior, posterior, and side views of ventral valve. The arching of the cardinal line of the area is well shown in this shell. U. S. Nat. Mus. Cat. No. 35287q.

1b and 1b′. Exterior, side, and posterior views of ventral valve. The straight, horizontal cardinal line of the area is a feature of this shell. U. S. Nat. Mus. Cat. No. 35287b.

1c and 1c′. Exterior, with side and posterior views, of ventral valve with nearly straight cardinal line of shell and area. U. S. Nat. Mus. Cat. No. 35287c. Compare the outline and slope of the area in this specimen with that shown in figures 1 and 1a.

1d and 1e. Exterior and side views of two ventral valves. U. S. Nat. Mus. Cat. Nos. 35287d and 35287e, respectively.

1f–1j. Exterior and side views of dorsal valves, to illustrate variation in outline and convexity of valve. U. S. Nat. Mus. Cat. Nos. 35287f–j, respectively.

1k. Cast of interior of ventral valve with side outline. U. S. Nat. Mus. Cat. No. 35287k.

1k′. Posterior view of specimen represented by figure 1k, showing posterior outline of cardinal scars and the vascular canals; also base of cast of foramen. U. S. Nat. Mus. Cat. No. 35287k.

1 l. Cast of the interior and side outline of a dorsal valve. This illustrates all that is known of the interior of this valve from the casts. An interior from another locality is shown by figure 1r. U. S. Nat. Mus. Cat. No. 35287 l.

1m–1p. Casts of the interior and side outlines of ventral valves that illustrate the variation in size and position of the cardinal scars and vascular canals. U. S. Nat. Mus. Cat. Nos. 35287m–p, respectively.

The specimens represented by figures 1, 1a–p are from Locality **88a**, Middle Cambrian limestone about 100 feet (30.5 m) above the quartzitic sandstone at the base of the Cambrian, in the northern suburbs of Deadwood, Black Hills, South Dakota.

Figures 1q, 1q′, and 1q″. Top, side, and back views of exterior of ventral valve that is more elevated than usual and which has a very high false area. U. S. Nat. Mus. Cat. No. 52188a.

1r. Interior of dorsal valve on which the area is preserved, also the depressions of the cardinal scars and a low, broad, median ridge, but no traces of the central or anterior lateral scars. This is the only specimen found showing the interior of the valve, except in the form of casts (fig. 1 l). U. S. Nat. Mus. Cat. No. 52188b.

The specimens represented by figures 1q and 1r are from Locality **9p**, Upper Cambrian, about 160 feet (48.8 m) above the porphyry contact in the limestone of the Reagan sandstone, in SE. ¼ NE. ¼ sec. 2, T. 4 N., R. 13 W., about 15 miles (24.2 km.) northwest of Fort Sill, Comanche County, Oklahoma.

Linnarssonella minuta (Hall and Whitfield) (p. 667).

Figure 2. Interior of a ventral valve, showing cardinal scars and foramen. U. S. Nat. Mus. Cat. No. 24553a.

2a and 2a′. Cast of the interior of a ventral valve with side and posterior outlines. U. S. Nat. Mus. Cat. No. 24553b.

2b. Cast of the interior of a dorsal valve and side view of same. U. S. Nat. Mus. Cat. No. 24553c.

The specimens represented are all from Locality **313h**, Upper Cambrian sandy shale on Hamburg Ridge, Eureka district, Nevada. They all occur on the same hand specimen with the shells represented by Hall and Whitfield [1877, Pl. I, figs. 3 and 4], but the latter shells, which include the type, are not figured in this monograph.

FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON.

Linnarssonella tennesseensis Walcott (p. 669).

Figures 3 and 3′. Exterior and side views of a ventral valve from Locality **13**, Middle Cambrian limestones of the Rome formation 1.5 miles (2.4 km.) east of Post Oak Springs [Hayes, 1894, areal geology sheet], Roane County, Tennessee. U. S. Nat. Mus. Cat. No. 35289a. This is the type specimen.

3a. Cast of the exterior of a ventral valve from Locality **107b**, Middle Cambrian shales in the Rome formation in Bull Run, northwest of Copper Ridge [Keith, 1896b, areal geology sheet], 11 miles northwest of Knoxville, Tennessee. U. S. Nat. Mus. Cat. No. 35288a.

3, 3b′, and 3c, 3c′. Top and back views of casts of ventral valves associated with the specimen represented by fig. 3. U. S. Nat. Mus. Cat. Nos. 35289b and 35289c, respectively.

3d, 3e, 3f, and 3g. Casts of the interior of ventral valves associated with the specimen represented by figure 3a. U. S. Nat. Mus. Cat. Nos. 35288b, 35288c, 35288g, and 35288h, respectively. Figures 3f and 3g (with fig. 3k) represent the specimens that were referred to *Meekina prima* (see p. 669).

3h, 3j, and 3k. Casts of interior of dorsal valves associated with the specimen represented by figure 3a. U. S. Nat. Mus. Cat. Nos. 35288d, 35288e, and 35288i, respectively. Another specimen (Cat. No. 35288f) was used to restore certain portions of this figure. Figures 3k, 3f, and 3g represent the forms that were referred to *Meekina prima* (see p. 669).

3i. Cast of interior of dorsal valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 35289d.

Acrotreta spinosa Walcott (p. 713).

Figures 4, 4′, and 4″. Top, side, and back views of a ventral valve. U. S. Nat. Mus. Cat. No. 52176a.

4a. Top view of a ventral valve, with the apex in front of the posterior margin. U. S. Nat. Mus. Cat. No. 52176b.

4b. Top view of a ventral valve, the type specimen, with the apex overhanging the posterior margin, and showing spinose surface. U. S. Nat. Mus. Cat. No. 52176c.

4c. Exfoliated ventral valve, showing cast of the apical callosity and main trunks of the vascular sinuses. U. S. Nat. Mus. Cat. No. 52176d.

4d. Exfoliated ventral valve from Locality **62**, Upper Cambrian limestone in the Dunderberg shale [Walcott, 1908f, p. 184], in canyon immediately north of Adams Hill, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 52177a.

4e. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52176e.

4f. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52176f. (See fig. 4g.)

4g. Enlargement of the surface of the specimen represented by figure 4f, to illustrate spinose character of the outer shell. U. S. Nat. Mus. Cat. No. 52176f.

With the exception of figure 4d, the specimens represented are all from Locality **61**, Upper Cambrian limestone in the Dunderberg shale, a little south of the Hamburg mine, Eureka district, Nevada.

Acrotreta?? cancellata Walcott (p. 679).

Figures 5 and 5′. Top and side views of the type specimen, a ventral valve, from Locality **205**, passage beds between the Upper Cambrian and the Ordovician, siliceous limestones on Round top Mountain, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 52079a.

5a. Enlargement of outer surface (×20) of the specimen represented by figure 5.

Acrotreta attenuata Meek (p. 675).

[Pl. LXIV, figs. 1, 1a–o.]

Figure 6. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52068a.

6a. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52068b.

The specimens represented are both from Locality **3x**, Middle Cambrian limestone in 1d of the Marjum limestone, 2.5 miles (4 km.) east of Antelope Springs, in ridge east of Wheeler Amphitheater, House Range, Utah.

PLATE LXXX.

PLATE LXXX.

cl. Cardinal scar.
fa. False area.
fp. False pedicle groove.
v. Visceral area.
vs. Main vascular sinus.
x′. Cast of foraminal tube.

Acrothyra signata Matthew (p. 719).

Figure 1. Ventral valve from Locality **344k**, Middle Cambrian sandstones of Division E1b of Matthew's Etcheminian, Dugald Brook, Cape Breton, showing cast of visceral area. University of Toronto, Canada. Type specimen, figured by Matthew [1902b, Pl. XIII, fig. 2b].

1a. Broad form of ventral valve from Locality **10p**, Middle Cambrian sandstones of Division E2b of Matthew, on Dugald Brook, Indian River, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52057a.

1b. Compressed, nearly circular ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52057b.

1c. Partly exfoliated dorsal valve from Locality **10p**, Middle Cambrian sandstones of Division E2b of Matthew, on Dugald Brook, Indian River, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52057c.

1d. Side outline of a ventral valve from the locality represented by figure 1. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XIII, fig. 2c].

Acrothyra signata prima Matthew (p. 720).

Figure 2. Ventral valve showing cast of visceral area. University of Toronto, Canada. Type specimen, figured by Matthew [1902b, Pl. XIII, fig. 1b].

2a. Top, side, and back views of a narrow form of ventral valve. U. S. Nat. Mus. Cat. No. 52059a.

2b. Side outline of a ventral valve. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XIII, fig. 1c].

The specimens represented are all from Locality **13k**, Middle Cambrian shales of Matthew's Coldbrook, on Dugald Brook, Indian River, Cape Breton, Nova Scotia.

Acrothyra signata orta Matthew (p. 719).

Figure 3. Exterior view of ventral valve from Locality **13d″**, Middle Cambrian sandstones between Divisions E2a and E2b of Matthew's Etcheminian, on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52058a.

3a. A broken shell showing cast of visceral area from Locality **344l**, Middle Cambrian sandstones of Division E2c of Matthew's Etcheminian, Dugald Brook, Cape Breton. University of Toronto, Canada. Type specimen, figured by Matthew [1902b, Pl. XIII, fig. 4a].

3b. Side outline of a ventral valve from the locality represented by figure 3a. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XIII, fig. 4c].

Acrothyra sera (Matthew) (p. 718).

Figure 4. Ventral valve, somewhat compressed, from Locality **13t″**, Middle Cambrian sandstones of Division E1c and E1d on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52054a.

4a, 4a′, and 4a″. Top, side, and back views of a typical form of ventral valve associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 52054b.

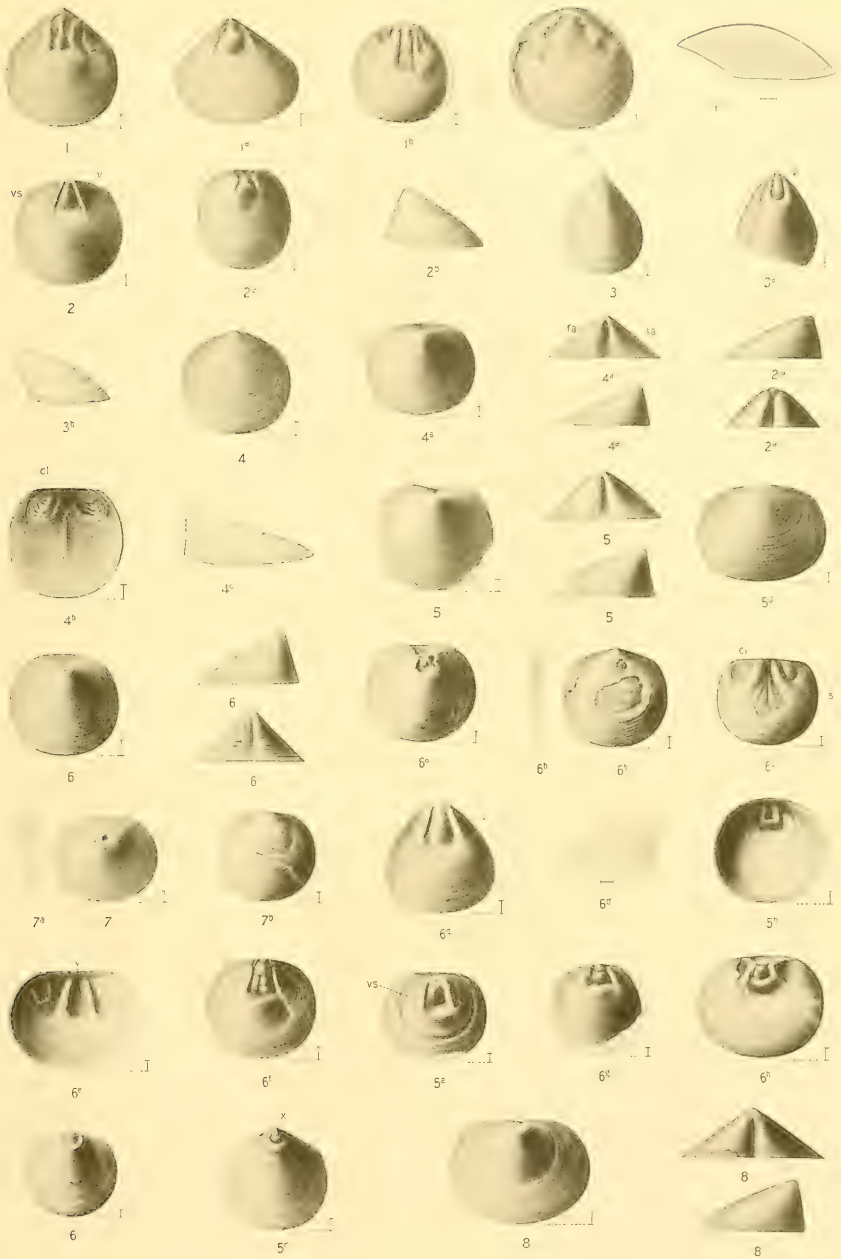
4b. Interior of a dorsal valve (locality unknown). University of Toronto, Canada.

4c. Side outline of a ventral valve from Locality **344g**, Middle Cambrian shales of Division E1c of Matthew's Etcheminian, Dugald Brook, Cape Breton. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XIII, fig. 3c] as *Acrothyra* (*signata*) *sera*.

5, 5′, and 5″. Top, side, and back views of ventral valve associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 52054c.

5a. Ventral valve associated with the specimen represented by figure 4, showing cast of visceral area. U. S. Nat. Mus. Cat. No. 52054d.

5b. Interior of ventral valve showing elevated ridge about foraminal tube. Locality **10p**, Middle Cambrian sandstone in Division E2b on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 58306.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

ACROTHYRA SERA Matthew—Continued.

FIGURE 5c. Cast of interior of a shell associated with the specimen represented by figure 4 showing cast of foraminal tube. U. S. Nat. Mus. Cat. No. 52054e.

5d. Exterior of dorsal valve associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 52054f.

Figures 5, 5a–d are drawn from typical forms of *Acrothyra signata tarda* of Matthew.

FIGURES 6, 6′, and 6″. Top, side, and back views of a ventral valve from Locality **13k**, Middle Cambrian, shales of Matthew's Coldbrook, Dugald Brook, Cape Breton. University of Toronto, Canada. Specimen figured by Matthew [1902b, Pl. XV, figs. 2a and 2b] as *Acrotreta papillata*.

6a. Ventral valve with apex of shell broken away so as to show the cast of the foraminal tube, associated with the specimen represented by figure 4. U. S. Nat. Mus. Cat. No. 52054g.

6b and 6b′. Dorsal valve with side outline. U. S. Nat. Mus. Cat. No. 52054h.

6c. Cast of interior of dorsal valve. Compare with figure 4b. U. S. Nat. Mus. Cat. No. 52054i.

6d and 6d′. Top and side views of a cast of the interior of a ventral valve with elongate visceral area. U. S. Nat. Mus. Cat. No. 52054j.

6e. Interior of a ventral valve with elongate visceral area. U. S. Nat. Mus. Cat. No. 52054k.

6f, 6g, and 6h. Ventral valves illustrating variation in form and length of visceral area. U. S. Nat. Mus. Cat. Nos. 52054l, 52054m, and 52054n, respectively.

6i. Ventral valve from Locality **13k**, Middle Cambrian, shales of Matthew's Coldbrook, on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52055c.

The specimens represented by figures 6, 6a–i are typical forms of "*Acrotreta papillata*" of Matthew. With the exception of figures 6 and 6i all of the specimens are from Locality **13t″**, Middle Cambrian sandstones of Divisions E1c and E1d of Matthew on Dugald Brook, Cape Breton, Nova Scotia.

FIGURES 7 and 7a. Top and side views of a ventral valve associated with the specimen represented by figure 6i. U. S. Nat. Mus. Cat. No. 52055a.

7b. Exterior of dorsal valve associated with the specimen represented by figure 6i. U. S. Nat. Mus. Cat. No. 52055b.

The specimens represented by figures 7, 7a–b are typical forms of "*Acrotreta papillata prima*" of Matthew.

FIGURES 8, 8′, and 8″. Top, back, and side views of a shell somewhat doubtfully referred to this species from Locality **13p**, Middle Cambrian sandstones 40 feet above division E2a of Matthew, on Dugald Brook, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52056a.

PLATE LXXXI.

PLATE LXXXI.

a. Cardinal area.
cf. Closed foraminal tube (see p. 629).
cl. Cardinal scar.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
lk. Outside and middle lateral muscle scars.
m. Muscle scars on front face of platform.
pc. Pedicle furrow.
pl. Platform.
pl'. Central ridge of platform.
s. Median ridge.
t. Cardinal process of dorsal valve (see p. 565).
vs. Vascular sinus.
x. Cavity beneath platform.

Schizopholis rugosa Waagen (p. 609).

[Pl. I, fig. 4c.]

Figures 1, 1a, and 1b. Top, side, and back views of the type specimen, a ventral valve. Geol. Survey India Cat. No. 3/790. Specimen figured by Waagen [1885, Pl. LXXXVI, figs. 4a–d; and 1891, Pl. II, figs. 12a–c].

1c. Exterior view of dorsal valve. Geol. Survey India Cat. No. 3/789. Specimen figured by Waagen [1885, Pl. LXXXVI, figs. 3a–b; and 1891, Pl. II, figs. 14a–b].

The specimens represented are all from Locality **357c**, Middle Cambrian, lower portion of the "*Neobolus* beds" of the Khussak group, in purplish-colored, fine-grained, micaceous sandstone near the fresh-water springs in a gorge above the salt mines at Kiura (Khewra), Salt Range, India.

Neobolus warthi Waagen (p. 566).

[Text figs. 47A–B, p. 567, and Pl. I, figs. 3, 4, 4a-b, 5, and 5a.]

Figure 2. View of a partly exfoliated ventral valve. Geol. Survey India Cat. No. 3/783. Specimen figured by Waagen [1885, Pl. LXXXV, figs. 3a–b; and 1891, Pl. II, figs. 3a–b].

2a. Compressed ventral valve. Geol. Survey India Cat. No. 3/787. Specimen figured by Waagen [1885, Pl. LXXXVI, figs. 1a–b] as *Davidsonella squama*, and [1891, Pl. II, figs. 6a–b] as *Neobolus warthi*.

2b and 2c. Side and back views of a ventral valve showing supposed foraminal aperture. (See p. 566.) This shell is on the same piece of rock as the dorsal valve represented by figure 2d.

2d. Exterior view of dorsal valve. Geol. Survey India Cat. No. 3/784. Specimen figured by Waagen [1885, Pl. LXXXV, figs. 4a–b; and 1891, Pl. II, figs. 4a–b].

2e. View of the interior of a ventral valve. Geol. Survey India Cat. No. 3/786. Specimen figured by Waagen [1885, Pl. LXXXV, fig. 5; and 1891, Pl. II, fig. 3c].

2f. View of the interior of a dorsal valve, the type specimen. Geol. Survey India Cat. No. 3/785. Specimen figured by Waagen [1885, Pl. LXXXV, fig. 5; and 1891, Pl. II, fig. 4c].

2g. Enlargement of the posterior portion of figure 2f.

2h. Front view of the process and platform shown in figure 2g.

The specimens represented are all from Locality **357a**, Middle Cambrian, lower portion of the "*Neobolus* beds" in purplish, fine-grained, micaceous sandstone at Jutána, Salt Range, India.

Discinolepis granulata Waagen (p. 664).

Figure 3. Exterior view of the type specimen, a ventral valve, from Locality **357a**, Middle Cambrian, lower portion of the "*Neobolus* beds" in purplish, fine-grained, micaceous sandstone at Jutána, Salt Range, India. Geol. Survey India Cat. No. 3/792. Specimen figured by Waagen [1885, Pl. LXXXVI, figs. 6a–b; and 1891, Pl. II, figs. 16a–b].

3a and 3b. Back and side views of a ventral valve from Locality **357c**, Middle Cambrian, lower portion of the "*Neobolus* beds" in purplish, fine-grained, micaceous sandstone near the fresh-water springs in a gorge above the salt mines at Kiura (Khewra), Salt Range, India. Geol. Survey India Cat. No. 3/791. The triangular space shown in figure 3a is not filled in with the shell; it is an open slit. Specimen figured by Waagen [1885, Pl. LXXXVI, figs. 5a–b; and 1891, Pl. II, figs. 15a–b].

FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

KEYSERLINGIA BUCHI (de Verneuil) (p. 628).

FIGURE 4. Exterior view of a fragmentary ventral valve. U. S. Nat. Mus. Cat. No. 52049a. (See figs. 4b and 4c.)
4a. Interior view of the posterior portion of a ventral valve. U. S. Nat. Mus. Cat. No. 52049d.
4b. Interior of the posterior portion of the specimen represented by figure 4.
4c. Posterior view of the specimen represented by figures 4 and 4b.
4d. Interior view of the posterior portion of a ventral valve in which the pedicle tube projects and opens toward the front of the valve. U. S. Nat. Mus. Cat. No. 52049b.
4d′ and 4d″. Side and front views of specimen represented by figure 4d.
4e. Interior of the posterior portion of a dorsal valve. U. S. Nat. Mus. Cat. No. 52049c.

The specimens represented are all from Locality **9d**, Upper Cambrian *Obolus* sandstone at Jaggowal, about 20 miles (32 km.) east-southeast of Reval, Government of Esthonia, Russia.

SIPHONOTRETA VERRUCOSA (Eichwald) (p. 627).

FIGURES 5, 5a, and 5b. Ventral, dorsal, and side views of a specimen having the two valves united. U. S. Nat. Mus. Cat. No. 52217a. From Locality **337m**, passage beds between the Upper Cambrian and the Ordovician, *Orthoceratite* limestone at Popowka, near St. Petersburg, Russia.

SIPHONOTRETA UNGUICULATA (Eichwald) (p. 626).

FIGURES 6 and 6a. Ventral and dorsal views of a shell having the two valves united, from Locality **337m**, passage beds between the Upper Cambrian and the Ordovician, *Orthoceratite* limestone at Popowka, near St. Petersburg, Russia. U. S. Nat. Mus. Cat. No. 52218a.
6b. Side view of the specimen represented by figures 6 and 6a.
6c. Interior of posterior portion of ventral valve, showing opening of pedicle tube and the muscle scars. Copied from Davidson [1877, Pl. II, fig. 9].
6d and 6e. Interior of dorsal and ventral valves, respectively. From a cast of a natural mold of a specimen which has the two valves united and which is from the same locality as the specimen represented by figures 6, 6a–b. U. S. Nat. Mus. Cat. No. 52218b.

SIPHONOTRETA ? DUBIA Walcott (p. 625).

FIGURES 7 and 7a. Top, side, and posterior views of ventral valves from Locality **1v**, Lower Cambrian shales of No. 3 of the Silver Peak group [Walcott, 1908f, p. 189], 3 miles (4.8 km.) north of Valcalda Spring and 4 miles (6.4 km.) west-northwest of the Drinkwater mine, Silver Peak quadrangle (U. S. Geol. Survey), Esmeralda County, Nevada. U. S. Nat. Mus. Cat. Nos. 52215a and 52215b. Figure 7 represents the type specimen.
7b. Exterior view of a fragmentary dorsal valve associated with the specimens represented by figures 7 and 7a. U. S. Nat. Mus. Cat. No. 52215c.

ORBICULOIDEA VARIANS (Barrande) (p. 723).

FIGURE 8. Ventral valve from Locality **303c**, passage beds between the Upper Cambrian and Ordovician, suburbs of Hof, Bavaria, × ½. Copied from Barrande [1868a, fig. 71]. This is the type specimen.

ORBICULOIDEA CONTRARIA (Barrande) (p. 722).

FIGURE 9. Ventral valve from Locality **303c**, passage beds between the Upper Cambrian and the Ordovician, suburbs of Hof, Bavaria, × ½. Copied from Barrande [1868a, fig. 72]. This is the type specimen.

PHILHEDRA COLUMBIANA (Walcott) (p. 724).

FIGURES 10 and 10′. Summit and back views of the type specimen. Locality **14s**, Middle Cambrian *Ogygopsis* zone, on Mount Stephen, above Field, British Columbia. U. S. Nat. Mus. Cat. No. 58307. Copied from Walcott [1908c, Pl. I, figs. 5 and 5a].

ORBICULOIDEA PILEOLUS (Hicks MS.) (Salter) (p. 722).

FIGURE 11. Exterior of ventral valve, the type specimen, from Locality **318d**, Middle Cambrian, Menevian sandstones at Porth-y-rhaw, St. Davids, South Wales. Copied from Davidson [1868, Pl. XVI, fig. 11a].

11a. Exterior of dorsal valve from the locality represented by figure 11. Copied from Davidson [1868, Pl. XVI, fig. 12a].

ACROTHELE LEVISENSIS Walcott (p. 646).

FIGURE 12. Exterior of a compressed ventral valve, the type specimen. Geol. Survey Canada. Copied from Walcott [1908d, Pl. VIII, fig. 13].

12a. Exterior of a compressed dorsal valve. Geol. Survey Canada.

12b. Cast of the interior of a dorsal valve. Geol. Survey Canada.

The specimens represented are all from Locality **319a**, Lower Ordovician Levis shales at Point Levis, Quebec, Canada.

PLATE LXXXII.

PLATE LXXXII.

cl. Cardinal scar.
F. Foramen.
F'. Cast of foraminal tube.
vs. Vascular sinuses.

Yorkia wanneri Walcott (p. 612).

Figure 1. Exterior of a corrugated ventral valve, drawn from a cast of a natural matrix. U. S. Nat. Mus. Cat. No. 26433j.

1a. Exterior and side outline of a smooth ventral valve, drawn from a cast of a natural matrix. U. S. Nat. Mus. Cat. No. 26433a. Specimen figured by Walcott [1897b, Pl. LX, fig. 1].

1b. Top view, back view, and side outline of an elevated ventral valve, drawn from a cast of a natural matrix. U. S. Nat. Mus. Cat. No. 26433b.

1c. Top and back views of cast of the interior. U. S. Nat. Mus. Cat. No. 26433c. Specimen figured by Walcott [1897b, Pl. LX, fig. 1a].

1d. Exterior of a dorsal valve, drawn from a cast of a natural matrix. U. S. Nat. Mus. Cat. No. 26433d.

1e. Cast of the interior of the posterior portion of a ventral valve. U. S. Nat. Mus. Cat. No. 26433e.

1f and 1g. Casts of the interiors of ventral valves, with side outlines of same. U. S. Nat. Mus. Cat. Nos. 26433f and 26433g, respectively. The specimen represented by figure 1g, the type, was figured by Walcott [1897b, Pl. LX, figs. 1b and 1c].

1h. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 26433h. Specimen figured by Walcott [1897b, Pl. LX, fig. 1d].

1i. Area of dorsal valve drawn from the cast of a natural mold (original specimen missing). U. S. Nat. Mus. Cat. No. 26433i. Specimen figured by Walcott [1897b, Pl. LX, fig. 1e].

The specimens represented are all from Locality **49**, Lower Cambrian sandstone on Codorus Creek, near Emigsville, York County, Pennsylvania.

Yorkia? washingtonensis Walcott (p. 613).

Figure 2. Cast of the interior of a ventral valve from Locality **37b**, Lower Cambrian limestone 0.25 mile (0.4 km.) east of Salem, Washington County, New York. U. S. Nat. Mus. Cat. No. 26434a. Type specimen figured by Walcott [1897b, Pl. LX, fig. 3].

2a. Cast of the interior of a dorsal valve from Locality **338n**, Lower Cambrian, western belt of conglomeratic limestone, Rensselaer County, New York. U. S. Nat. Mus. Cat. No. 52207a.

Yorkia? orientalis Walcott (p. 612).

Figures 3 and 3'. Top and side views of ventral valve from Locality **C71**, Middle Cambrian limestone in Kichou formation [Willis and Blackwelder, 1907, pp. 139 and 145], 4 miles (6.4 km.) southwest of Tungyu, Shansi, China. U. S. Nat. Mus. Cat. No. 52521a. This is the type specimen.

3a. Enlargement of the outer surface of the specimen represented by figure 3.

Yorkia? miqueli Walcott (p. 611).

Figure 4. Exterior of ventral valve from Locality **342a**, Lower Ordovician?, barren quartzitic beds at Coulouma, Department of Hérault, France. This is the type specimen. Collection of J. Miquel.

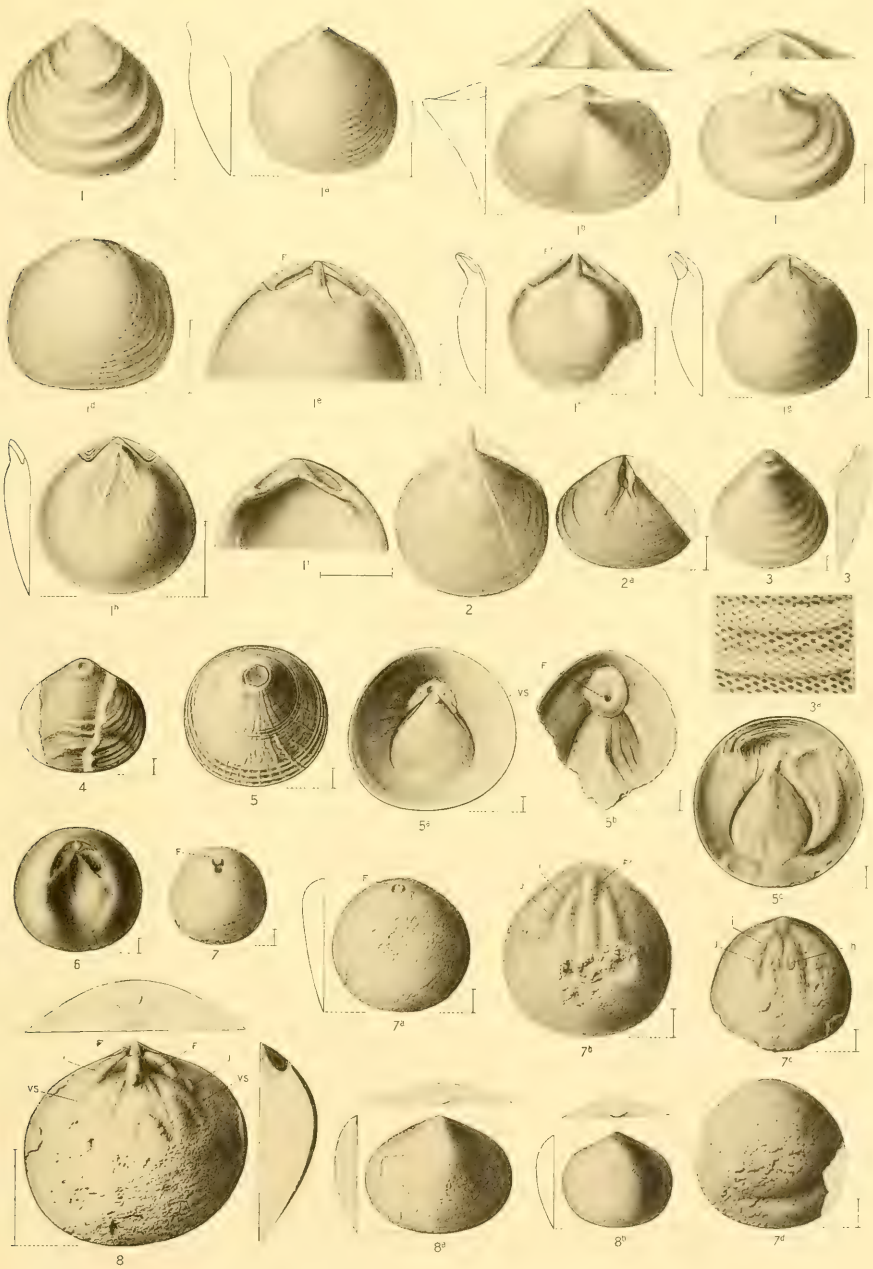
Discinopsis gulielmi (Matthew) (p. 720).

Figure 5. A compressed ventral valve. Type specimen, figured by Matthew [1886, Pl. V, figs. 14c and 14d].

5a and 5b. Interiors of ventral valves. Figure 5a is drawn from the specimen figured by Hall and Clarke [1892a, Pl. III, fig. 21, and 1892c, Pl. III, figs. 21 and 22]. Figures 5a and 5b are drawn from specimens among those figured by Matthew [1886, Pl. V, figs. 14, 14a–b, and 14e], but closer identification is impossible.

5c. Interior of a dorsal valve. Specimen figured by Hall and Clarke [1892c, Pl. III, fig. 23]. Its identification with any of the figures given by Matthew [1886, Pl. V, figs. 14, 14a–b, and 14e] is impossible.

The specimens represented are all from Locality **301g**, Middle Cambrian sandstones of Division 1c of Matthew at Portland, now a part of the city of St. John, St. John County, New Brunswick. They are in the collection of the University of Toronto, Canada.



FRANCES WIESER DEL.

Discinopsis? sulcatus Walcott (p. 721).

Figure 6. Cast of the interior of a ventral? valve, the type specimen, from Locality **C56**, Upper Cambrian Chaumitien limestone at Pagoda Hill, 1 mile (1.6 km.) west of Tsinan, Shantung, China. U. S. Nat. Mus. Cat. No. 52522a.

Dearbornia clarki Walcott (p. 614).

Figures 7 and 7a. Exteriors of ventral valves. U. S. Nat. Mus. Cat. Nos. 52214a and 52214b, respectively. Figure 7, that of the type specimen, is copied from Walcott [1908d, Pl. VIII, fig. 7].

7b. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52214c.

7c. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52214d.

7d. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52214e.

The specimens represented are all from Locality **9k**, Middle Cambrian limestone forming 1c of the Dearborn River section [Walcott, 1908f, p. 201], eastern part of the Lewis and Clark National Forest, Montana.

Trematobolus excelsis Walcott (p. 617).

Figure 8. Top view, with outline of side and back views, of a cast of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52208a. Copied from Walcott [1908d, Pl. VIII, fig. 8].

8a and 8b. Top view, with outline of side and back views, of exteriors of ventral valves. U. S. Nat. Mus. Cat. Nos. 52208b and 52208c, respectively.

The specimens represented are all from Locality **53**, Lower Cambrian sandstones in the lower portion of 3d of the Waucoba Springs section [Walcott, 1908f, pp. 187 and 188], 1 mile (1.6 km.) east of Saline Valley road about 2.5 miles (4 km.) east-northeast of Waucoba Springs, Inyo County, California.

PLATE LXXXIII.

PLATE LXXXIII.

cl. Cardinal scar.
F'. Cast of foraminal tube.
h. Central muscle scar.
j. Anterior lateral muscle scar.
s. Median septum.
v. Visceral area.
vs. Vascular sinuses.

Trematobolus kempanum (Matthew) (p. 619).

Figure 1. Exterior of a ventral valve, showing elongate slit into which the foramen opens, drawn from a cast of a natural matrix. U. S. Nat. Mus. Cat. No. 52212a.

1a. A dorsal valve associated with the specimen represented by figure 1, drawn from a cast of a natural matrix. U. S. Nat. Mus. Cat. No. 52212b.

1b. A crushed ventral valve from Locality **308g**, Middle Cambrian shales of Division 1b3 or 1b4 of Matthew's section on Long Island [Matthew, 1898a, pp. 124 and 127], Kennebecasis Bay, St. John County, New Brunswick. University of Toronto, Canada.

1c and 1d. Casts of the interiors of ventral valves. U. S. Nat. Mus. Cat. Nos. 52212c and 52212d, respectively.

1e. Cast showing cast of the foraminal tube; the dark portion represents the thickness of the shell. U. S. Nat. Mus. Cat. No. 52212e.

1f. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52212f.

1g. Natural cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52212g. (See fig. 1j.)

1h. Fragment showing the thickened shell on the posterior portion of a shell associated with the specimen represented by figure 1b. University of Toronto, Canada.

1i. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52212h.

1j. Interior of a ventral valve drawn from a cast of the specimen represented by figure 1g. U. S. Nat. Mus. Cat. No. 52212i.

1k. Enlarged view of a cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52212j.

1l. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52212k.

1m. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52212 l.

1n. Interior of a broken ventral valve drawn from a cast of a natural mold. U. S. Nat. Mus. Cat. No. 52212m.

1o. Fragment of the interior of a dorsal valve, showing the peculiar median septum. U. S. Nat. Mus. Cat. No. 52212n.

With the exception of figures 1b and 1h, all of the specimens represented are from Locality **2u**, Middle Cambrian, lowest beds exposed on the south side of Long Island [Matthew, 1898a, pp. 124 and 127], Kennebecasis Bay, St. John County, New Brunswick.

Trematobolus pristinus (Matthew) (p. 621).

[Pl. LXXXIV, fig. 6.]

Figure 2. Exterior of a ventral valve from Locality **2i**, Middle Cambrian sandstones of Division 1b3 of Matthew on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52213a.

2a. Interior of a ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52213b.

2b. Interior of a ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52213c.

2c. Natural cast of the interior of the ventral valve represented by figure 2b. U. S. Nat. Mus. Cat. No. 52213d.

The specimens represented by figures 2b and 2c are counterparts; another specimen (Cat. No. 56955b, from Locality **2h**) was used in drawing both figures.

Figure 2d. Cast of the interior of a dorsal valve from Locality **2h**, Middle Cambrian sandstones of Division 1b2 of Matthew on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 56955a.

2e. Exterior and side views of a dorsal valve from Locality **301**, Middle Cambrian sandstones of Division 1b2 of Matthew on Hanford Brook, St. John County, New Brunswick. Original in the collection of the University of Toronto, Canada; cast in the United States National Museum (Cat. No. 58308).

2f. Cast of the interior and side view of dorsal valve associated with the specimen represented by figure 2e. University of Toronto, Canada. Type specimen, figured by Matthew [1895a, Pl. IV, fig. 1c] as *Obolus pristinus*.

2g. Cast of the interior of a dorsal valve associated with the specimen represented by figure 2e. University of Toronto, Canada.

2h. Broken cast of interior of dorsal valve, with side outline, associated with the specimen represented by figure 2e. University of Toronto, Canada.

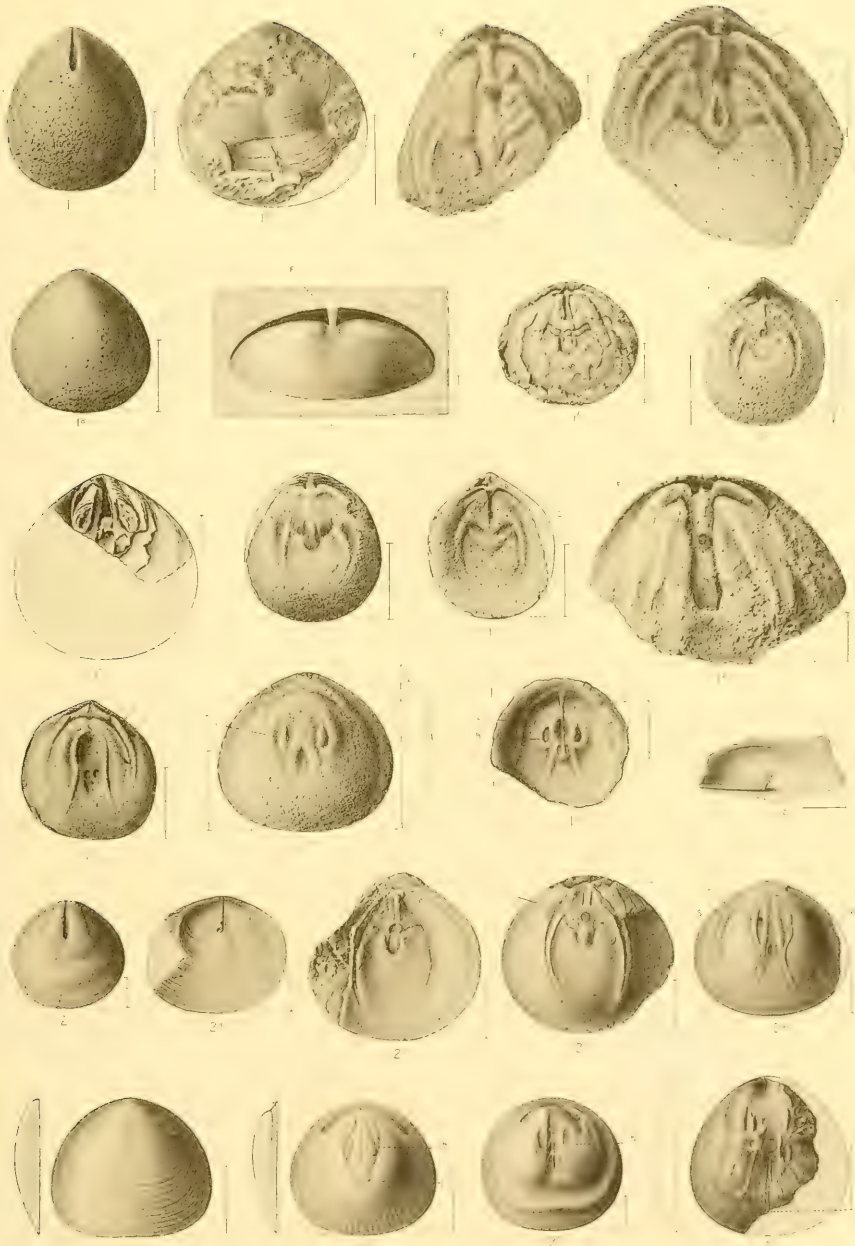


PLATE LXXXIV.

PLATE LXXXIV.

F. Foramen.
F′. Cast of foraminal tube.
g. Umbonal muscle scars.
h. Central muscle scar.
i. Transmedian muscle scar.
j. Anterior lateral muscle scar.
p. Cast of false pedicle furrow.
pf. Under side of pedicle furrow.
s. Median septum.
t. Teeth.
vs. Vascular sinus.

Schizambon typicalis Walcott (p. 624).

Figure 1. Exterior of ventral valve. U. S. Nat. Mus. Cat. No. 24556a.
1a. Interior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 24556b.
1b. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 24556c.
1c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 24556d.
1d. A portion of the surface enlarged to show the minute surface spines. U. S. Nat. Mus. Cat. No. 24556e.

The specimens represented are all from Locality **201a**, Lower Ordovician Pogonip limestone on east slope of ridge east of Hamburg Ridge, Eureka district, Nevada. The figures (1, 1a–d) are copied from Walcott [1884b, Pl. I, figs. 3a, 3, 3c, 3b, and 3d, respectively].

Schizambon priscus Matthew (p. 623).

Figures 2 and 2′. Exterior and side views of ventral valve from Locality **3q**, Upper Cambrian shale in Barachois Glen, 4 miles (6.4 km.) south of Little Bras d'Or Lake, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52226a.
2a. Exterior of ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52226b.
2b. Interior of ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52226c.
2c. Interior of a broken dorsal valve from Locality **101**, Upper Cambrian shale on east bank of Barachois River, 6 miles (9.6 km.) from Little Bras d'Or Lake, Cape Breton, Nova Scotia. U. S. Nat. Mus. Cat. No. 52227a.
2d. Interior of a dorsal valve associated with the specimen represented by figure 2c. U. S. Nat. Mus. Cat. No. 52227b.
2e. Interior of a dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52226d.

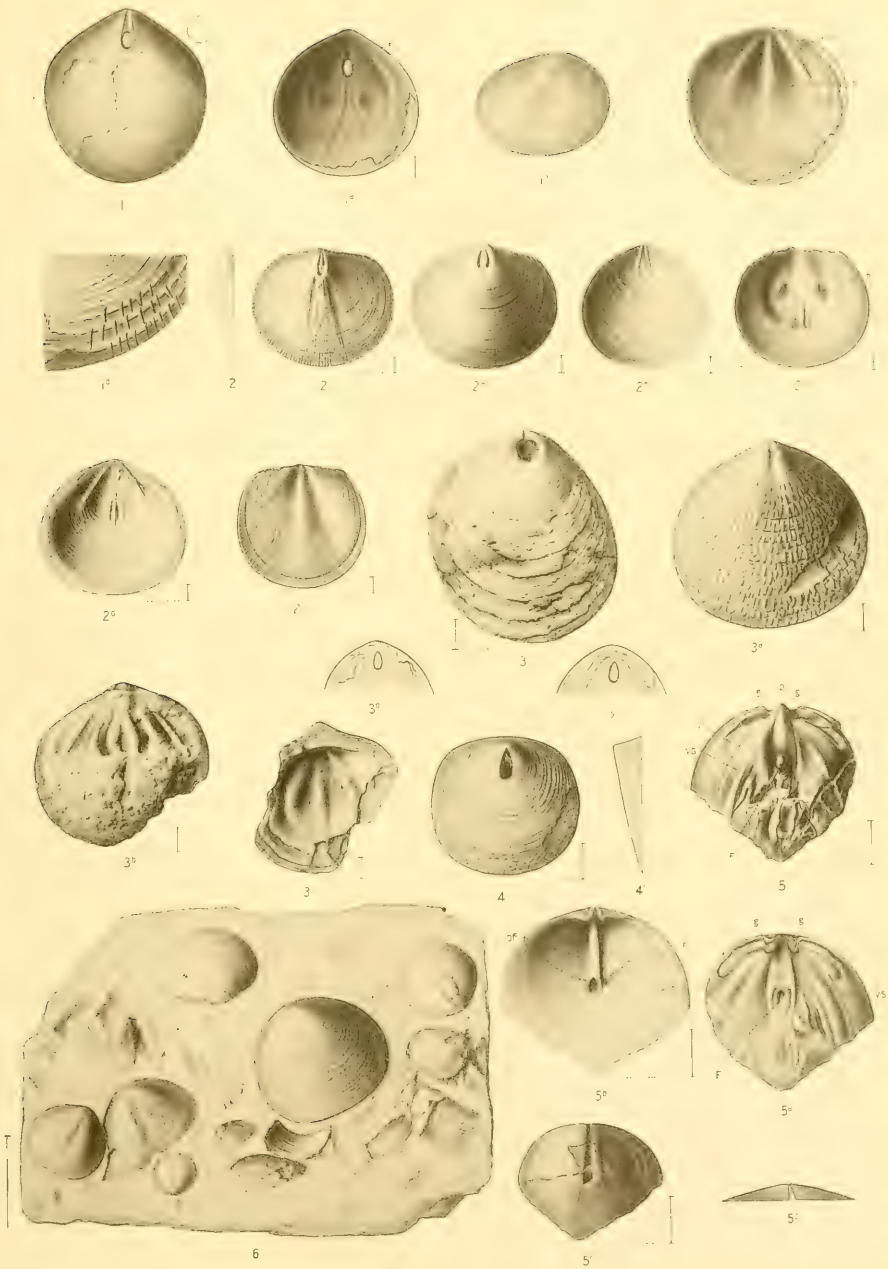
Schizambon manitouensis Walcott (p. 623).

Figure 3. Exterior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52224a.
3a. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52224b.
3b. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52224c.
3c. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52224d.
3d. Outline of posterior portion of cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52224e.
3e. Outline of posterior portion of interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52224f.

The specimens represented by figures 3, 3a–c are from Locality **186a**, and those represented by figures 3d and 3e from Locality **186**, a slightly lower horizon; both near the line between the red and gray Ordovician limestone in red limestone of Lower Ordovician age, Williams Canyon, Manitou, El Paso County, Colorado.

Schizambon? esthonia Walcott (p. 622).

Figures 4 and 4′. Exterior and side view of the type specimen, a ventral valve, from Locality **336h**, Upper Cambrian Ungulite grit, at Baltischport, Esthonia, Russia. U. S. Nat. Mus. Cat. No. 52222a.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

TREMATOBOLUS INSIGNIS Matthew (p. 617).

FIGURE 5. Natural cast of the interior of a ventral valve. University of Toronto, Canada. Type specimen, figured by Matthew [1893a, fig. 1b, p. 276]. (See fig. 5a.)

5a. Cast taken from the natural mold of the interior of the ventral valve represented by figure 5. U. S. Nat. Mus. Cat. No. 52211a.

5b. Interior of a ventral valve. University of Toronto, Canada. Specimen figured by Matthew [1893a, fig. 1a, p. 276]. (See fig. 5c.)

5c and 5c′. Top and back views of an artificial cast of the interior of the ventral valve represented by figure 5b. U. S. Nat. Mus. Cat. No. 52211b.

The two specimens represented are both from Locality **301**, Middle Cambrian sandstones of Division 1b2 of Matthew [1895a, p. 108], on Hanford Brook, St. John County, New Brunswick.

TREMATOBOLUS PRISTINUS (Matthew) (p. 621).

[Pl. LXXXIII, figs. 2, 2a–h.]

FIGURE 6. Reproduction of a small block of rock showing numerous specimens. Locality **2i**, Middle Cambrian sandstones of Division 1b3 of Matthew [1895a, p. 108], on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52213f.

PLATE LXXXV.

PLATE LXXXV.

a. Cardinal area.
a'. Anterior adductor impressions.
b. Dental sockets.
c. Crura.
d. Deltidium.
d'. Cast of umbonal cavity.
j. Cardinal process.
o. Ovarian spaces.
r. Visceral area.
t. Teeth.
vs. Vascular sinus.

Billingsella coloradoensis (Shumard) (p. 751).

[Text figs. 5, p. 299, and 66, p. 751.]

Figure 1. Exterior of typical form of ventral valve, from Locality **70**, Upper Cambrian limestone on Morgans Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 34777b. The surface of this specimen is enlarged in figure 1k. It is not the type specimen.

1a. Exterior of a silicified ventral valve, from Locality **302g**, Upper Cambrian limestone, north slope of Crowfoot Ridge, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 35213a. Copied from Walcott [1899, Pl. LXI, fig. 1].

1b. Ventral valve, from Locality **5a**, Upper Cambrian limestone of the St. Charles formation, 2 miles southeast of Malade, Oneida County, Idaho. The radiating striæ and concentric ridges of growth are very strongly marked on this specimen. Other specimens show the surface characters of figures 1 and 1e. U. S. Nat. Mus. Cat. No. 51403a.

1c. Partly exfoliated ventral valve from Locality **68**, Upper Cambrian limestone, Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. No. 34774a.

1d. Ventral valve from Locality **97**, Upper Cambrian "St. Croix sandstone," Reads Landing, Wabasha County, Minnesota. U. S. Nat. Mus. Cat. No. 34771a.

1e. Dorsal valve associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 34777c.

1f. Dorsal valve associated with specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 34777d.

1g. Dorsal valve associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35213b. Copied from Walcott [1899, Pl. LXI, fig. 1a].

1h. Dorsal valve associated with the ventral valve represented by figure 1d. U. S. Nat. Mus. Cat. No. 34771b.

1i. Dorsal valve with strongly marked radiating costæ, associated with the specimen represented by figure 1c. U. S. Nat. Mus. Cat. No. 34774b.

1j. Small dorsal valve showing deep mesial sinus. Locality **131**, Upper Cambrian "St. Croix sandstone," 4 miles east of Lake City, Wabasha County, Minnesota. U. S. Nat. Mus. Cat. No. 34770a.

1k. Enlargement of the surface of the specimen represented by figure 1.

1l. Group of silicified shells associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35213c.

1m. Interior cast of ventral valve, showing marked vascular sinuses, and a ridge corresponding to a median groove. Same locality as specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 34771c.

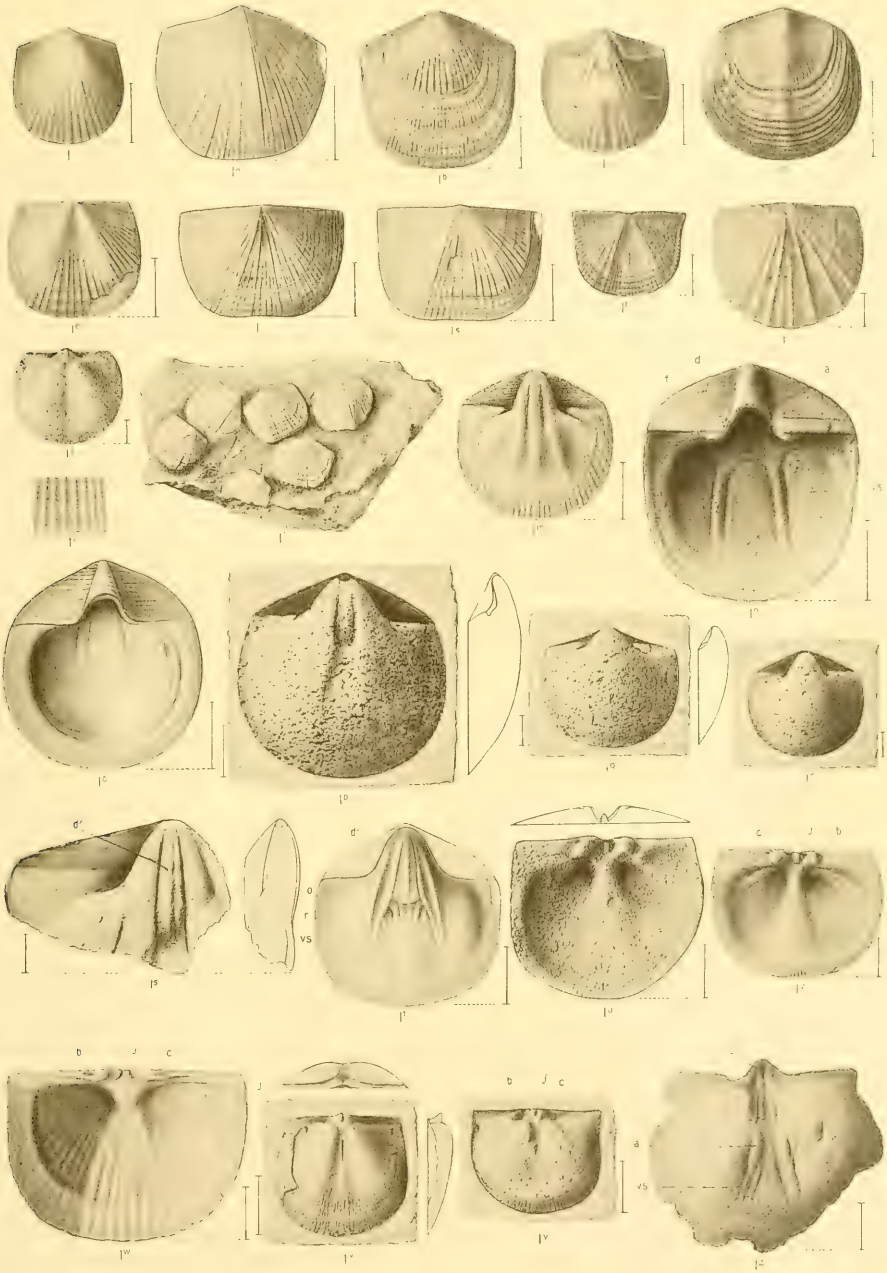
1n. Impression of interior of ventral valve probably associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 34771e. Drawn from an artificial cast, the original mold of which can not be located. The cast, with another (Cat. No. 34771f) which was used to restore portions of figure 1n, was in a tray with specimens from Locality **97**, but it may not belong there. (See fig. 1u.)

1o. Interior of ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35213d. Copied from Walcott [1899, Pl. LXI, fig. 1c].

1p, 1q, and 1r. Casts of interiors of ventral valves from Locality **83**[3], Upper Cambrian greensand horizon in "St. Croix sandstone," Trempealeau, Trempealeau County, Wisconsin. These three figures represent unusually convex specimens that may belong to a distinct species. U. S. Nat. Mus. Cat. Nos. 52235a, 52235b, and 52235c, respectively.

1s. Cast of the posterior portion of a ventral valve, with side outline. Locality **70a**, Upper Cambrian limestone, Morgans Creek, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 34777e.

1t. Cast of the interior of a ventral valve, associated with specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35213e. Copied with slight alterations from the figure given by Walcott [1899, Pl. LXI, fig. 1d].



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

BILLINGSELLA COLORADOENSIS (Shumard)—Continued.

FIGURE 1u. Interior of dorsal valve from impression taken from natural cast, with outline of posterior view. Probably from Locality 97, Upper Cambrian "St. Croix sandstone," Reads Landing, Wabasha County, Minnesota. U. S. Nat. Mus. Cat. No. 34771g. Drawn from an artificial cast, the original mold of which can not be located. The cast was in a tray with specimens from Locality 97, but it may not belong there. (See note under figure 1n.)

1v. Interior of dorsal valve associated with the specimen represented by figure 1c. U. S. Nat. Mus. Cat. No. 34774c.

1w. Interior of dorsal valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 35213f. Copied with slight alterations from the figure given by Walcott [1899, Pl. LXI, fig. 1b].

1x. Cast of the interior of dorsal valve, with side and posterior outlines. U. S. Nat. Mus. Cat. No. 51403b. From Locality 5a. (See fig. 1b.)

1y. Cast of dorsal valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 34771d.

1z. Cast of posterior portion of interior of dorsal valve from Locality 5b, Middle Cambrian Langston limestone, 2 miles (3.2 km.) southeast of Malade, Oneida County, Idaho. U. S. Nat. Mus. Cat. No. 34776a.

PLATE LXXXVI.

PLATE LXXXVI.

a. Cardinal area.
b. Dental sockets.
c. Crura.
d′. Cast of umbonal cavity.
d″. Umbonal cavity.
j. Cardinal process.
o. Ovarian areas.
vs. Vascular sinus.

Billingsella major Walcott (p. 758).

Figure 1. Portion of ventral valve, showing cast of cardinal area and surface costæ. Locality **116**, Upper Cambrian sandstone on Wells farm, 2 miles (3.2 km.) west of Baraboo, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. No. 52256a.

1a. Cast of compressed dorsal valve, the type specimen, associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52256b.

Figures 1 and 1a are copied from Walcott [1908d, Pl. X, figs. 1 and 1a].

Billingsella orientalis (Whitfield) (p. 759).

Figure 2. Type specimen, compressed in shale. Locality **319g**, Lower Cambrian shales in Parker's quarry, near Georgia, Franklin County, Vermont. Copied from Whitfield [1884, Pl. XIV, fig. 6] where it is figured as *Orthisina orientalis*.

2a and 2b. Ventral and dorsal valves, from Locality **25a**, Lower Cambrian limestone 2 miles (3.2 km.) east of Swanton, Franklin County, Vermont. U. S. Nat. Mus. Cat. Nos. 52262a and 52262b, respectively.

Billingsella plicatella Walcott (p. 759).

[Text fig. 1, p. 299.]

Figure 3. Exterior and side views of a ventral valve with rather strongly marked fasciculate costæ. U. S. Nat. Mus. Cat. No. 52263a.

3a. Exterior and side views of ventral valve with strong costæ. U. S. Nat. Mus. Cat. No. 52263b.

3b. Exterior view of ventral valve on which the surface has been partly smoothed by attrition. U. S. Nat. Mus. Cat. No. 52263c.

3c. Exterior and side views of a very convex ventral valve, marked by very fine radiating striæ and faint costæ. U. S. Nat. Mus. Cat. No. 52263d.

3d. Exterior of a small, strongly costate ventral valve from Locality **151**, Upper Cambrian limestone in point overlooking Churn Canyon, west side of the Bridger Range, Gallatin County, Montana. U. S. Nat. Mus. Cat. No. 52265a.

3e. Exterior of a small, strongly costate dorsal valve. U. S. Nat. Mus. Cat. No. 52263e.

3f. Exterior of ventral valve, partly smoothed by attrition. U. S. Nat. Mus. Cat. No. 52263f.

3g. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 52263g.

3h. Exterior and side view of dorsal valve smoothed by attrition. U. S. Nat. Mus. Cat. No. 52263h.

3i. Cast of interior of ventral valve, the type specimen, showing cardinal area, a; cast of vascular sinus, vs; and ovarian areas, o. U. S. Nat. Mus. Cat. No. 52263i.

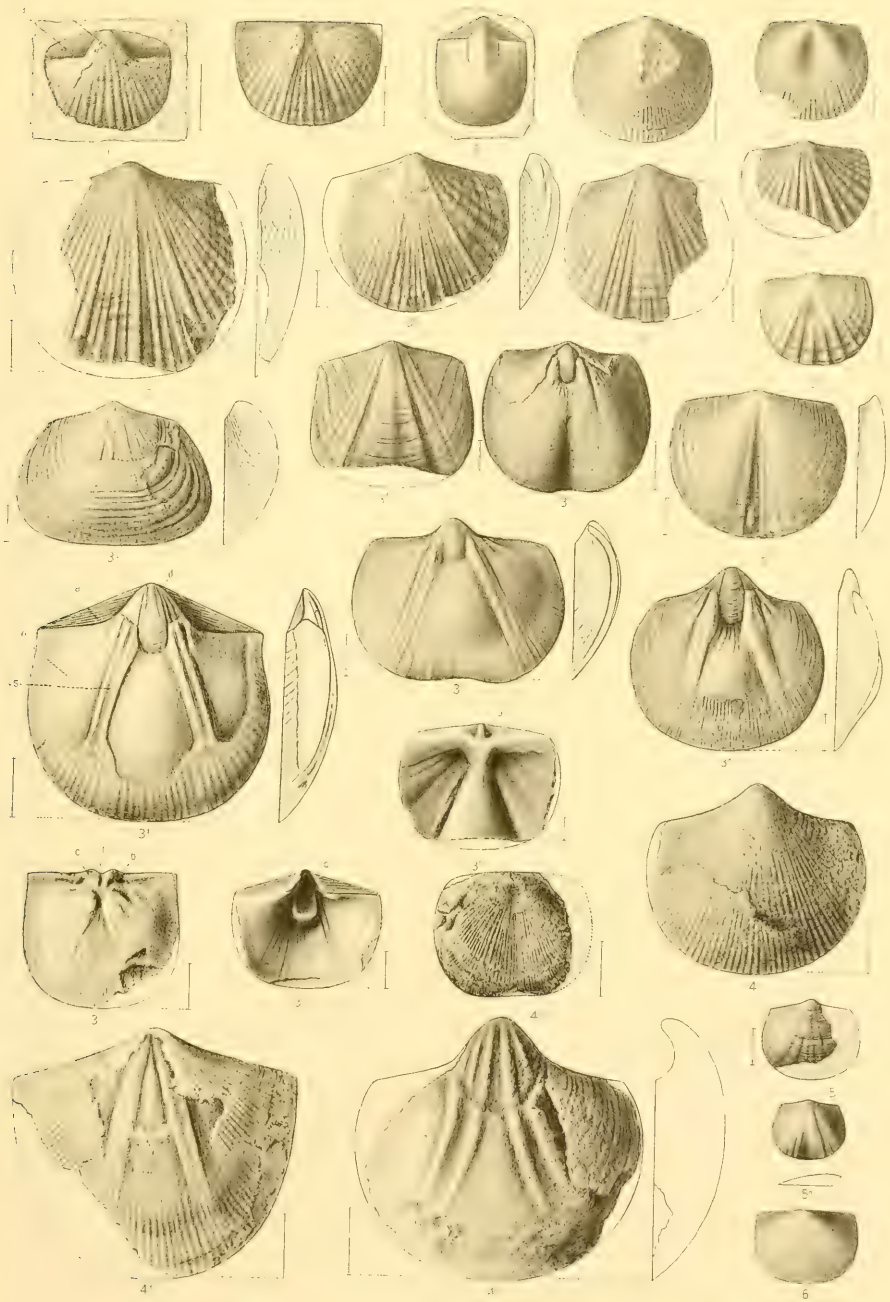
3j. Cast of interior and side outline of a transverse ventral valve. U. S. Nat. Mus. Cat. No. 52263j.

3k. Cast of interior and side outline of ventral valve, on which the vascular and other impressions are strongly marked. U. S. Nat. Mus. Cat. No. 52263k.

3 l. Cast of the interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52263 l.

3m and 3n. Interiors of small, strongly marked ventral and dorsal valves from Locality **4j**, Middle Cambrian limestones at the head of Deep Creek, Canyon quadrangle (U. S. Geol. Survey), Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. Nos. 52266a and 52266b, respectively.

With the exception of figures 3d, 3m, and 3n, all of the specimens represented are from Locality **158**, Upper Cambrian limestone north of East Gallatin River, near Hillsdale, Threeforks quadrangle (U. S. Geol. Survey), Gallatin County, Montana.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

BILLINGSELLA STRIATA Walcott (p. 764).

FIGURE 4. Exterior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52279a.
4a. Partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 52279b.
4b. Cast of interior of ventral valve and side outline. U. S. Nat. Mus. Cat. No. 52279c.
4c. Cast of imperfect dorsal valve. U. S. Nat. Mus. Cat. No. 52279d.

The specimens represented are all from Locality **149a**, Middle Cambrian limestone at the forks of Pole Creek, above Cherry Creek Basin, Threeforks quadrangle (U. S. Geol. Survey), Madison County, Montana.

BILLINGSELLA WHITFIELDI (Walcott) (p. 764).

FIGURE 5. Exterior of ventral valve, with outline restored, from Locality **55**, Middle Cambrian Eldorado limestone [Walcott, 1908f, p. 184], east slope of Prospect Mountain, in New York Canyon, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 24591a.
5a. Exterior of dorsal valve from Locality **55b**, Middle Cambrian Eldorado limestone, west side of Secret Canyon, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 57041a. This is the type specimen.

The figures (5 and 5a) are redrawn from the specimens illustrated by Walcott [1884b, Pl. IX, figs. 4, 4a-b].

BILLINGSELLA OBSCURA Walcott (p. 758).

FIGURE 6. Exterior of an imperfect dorsal valve from Locality **74**, Middle Cambrian sandstone about 300 feet (91.4 m. above the base of the Tonto group at the head of Nunkoweap Valley, Grand Canyon of the Colorado, Arizona. U. S. Nat. Mus. Cat. No. 52258a. This is the type specimen.

PLATE LXXXVII.

PLATE LXXXVII.

WIMANELLA? ANOMALA (Walcott) (p. 745).

FIGURE 1. Exterior of a compressed ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. ~~55223a~~ 52233a.
1a. Impression in shale of imperfect, compressed ventral valve. U. S. Nat. Mus. Cat. No. ~~55223b~~. 52233b
1b. Area and posterior portion of imperfect, compressed ventral valve. U. S. Nat. Mus. Cat. No. ~~55223c~~. 52233c
1c. Interior of distorted dorsal valve. U. S. Nat. Mus. Cat. No. ~~55223d~~. 52233d
1d. Impression in shale of distorted dorsal valve. U. S. Nat. Mus. Cat. No. ~~55223e~~. 52233e
1e. Exterior of dorsal valve doubtfully referred to this species. U. S. Nat. Mus. Cat. No. ~~55223f~~. 52233f

The specimens represented are all from Locality **90**, Middle Cambrian Conasauga shale on Edwards farm, near Craigs Mountain, about 10 miles (16 km.) southeast of Center, Cherokee County, Alabama.

BILLINGSELLA? APPALACHIA Walcott (p. 750).

FIGURE 2. Compressed and distorted ventral valve. U. S. Nat. Mus. Cat. No. 57073a.
2a. Compressed ventral valve, the type specimen, preserving surface costæ. U. S. Nat. Mus. Cat. No. 57073b.
2b. Impression in shale of compressed dorsal valve. U. S. Nat. Mus. Cat. No. 57073c.

The specimens represented are all from Locality **121**, Middle Cambrian Rogersville shale, road just east of Harlan Knob, 4 miles (6.4 km.) northeast of Rogersville, Hawkins County, Tennessee.

BILLINGSELLA SALEMENSIS (Walcott) (p. 763).

FIGURE 3. Exterior view of the type specimen, a ventral valve, with side outline. The slope of the cardinal area is drawn in from the position of the beak and the cardinal angle. U. S. Nat. Mus. Cat. No. 17443a.
3a. Exterior of an imperfect dorsal valve. U. S. Nat. Mus. Cat. No. 17443b.

The specimens represented by figures 3 and 3a are from Locality **36**, Lower Cambrian limestone, 1 mile (1.6 km.) south of Shushan and 3.5 miles (5.6 km.) north-northeast of Cambridge, Washington County, New York. The figures (3 and 3a) are redrawn from the specimens illustrated by Walcott [1887, Pl. I, figs. 17 and 17a, respectively].

BILLINGSELLA HIGHLANDENSIS (Walcott) (p. 756).

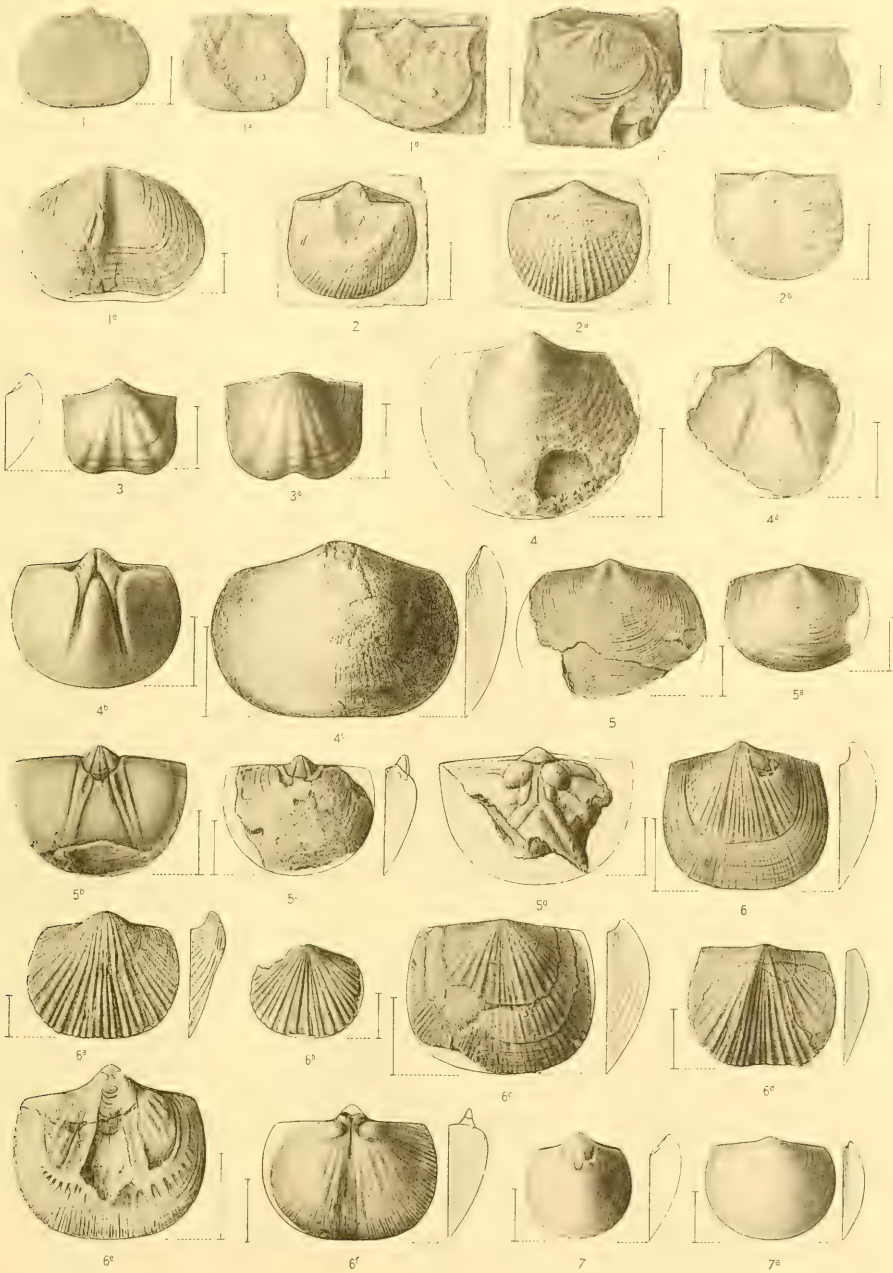
FIGURE 4. Exterior of imperfect ventral valve. U. S. Nat. Mus. Cat. No. 15355a. Specimen figured by Walcott [1886b, Pl. VIII, fig. 3b].
4a. Interior cast of ventral valve, the outline of which has been restored from another specimen (Cat. No. 15355e). U. S. Nat. Mus. Cat. No. 15355b.
4b. Interior cast of a ventral valve with deep furrows that represent the ridges of the main vascular trunks and the median ridge at the bottom of the delthyrium. The cast of the dental plates is also clearly shown. U. S. Nat. Mus. Cat. No. 15355c. Type specimen figured by Walcott [1886b, Pl. VIII, fig. 3a].
4c. Imperfect cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 15355d. Specimen figured by Walcott [1886b, Pl. VIII, fig. 3].

The specimens represented are all from Locality **31a**, Lower Cambrian limestone in Pioche formation near Pioche, Lincoln County, Nevada.

WIMANELLA HARLANENSIS (Walcott) (p. 746).

FIGURE 5. Exterior of imperfect ventral valve. U. S. Nat. Mus. Cat. No. 52252a. Another specimen (Cat. No. 52252b) was used in drawing certain portions of this figure.
5a. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52252c.
5b. Cast of interior of ventral valve, the type specimen, associated on same hand specimen with figure 5a. U. S. Nat. Mus. Cat. No. 52252d.
5c. Partial cast of interior of ventral valve. U. S. Nat. Mus. Cat. No. 52252e.
5d. Cast of interior of a beautifully preserved portion of an abnormal dorsal valve. U. S. Nat. Mus. Cat. No. 52252f. Another specimen (Cat. No. 52252g) was used in drawing certain portions of this figure.

The specimens represented are all from Locality **121**, Middle Cambrian Rogersville shale, road just east of Harlan Knob, 4 miles (6.4 km.) northeast of Rogersville, Hawkins County, Tennessee.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

Billingsella lindströmi (Linnarsson) (p. 757).

Figure 6. Exterior and side views of nearly entire ventral valve from Locality **320n**, Middle Cambrian limestones of the *Paradoxides forchhammeri* zone at Lovened, Djupadal, 19 miles (30.6 km.) south-southeast of Skara, Province of Skaraborg, Sweden. U. S. Nat. Mus. Cat. No. 52260a.

6a and 6b. Exterior views of ventral and dorsal valves with coarse costæ. U. S. Nat. Mus. Cat. Nos. 52259a and 52259b, respectively.

6c and 6d. Exterior and side views of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52259c and 52259d, respectively.

6e. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52259e.

6f. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52259f. The beak is added from another specimen (Cat. No. 52259g).

The specimens represented by figures 6a–f are all from Locality **320q**, Middle Cambrian limestones of the *Paradoxides forchhammeri* zone at Alunbruk (alum works), southern part of Oeland Island, Sweden.

Wimanella saffordi (Walcott) (p. 747).

Figure 7. Cast of interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52268a.

7a. Cast of interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52268b.

The specimens represented are both from Locality **14a**, Middle Cambrian sandstone of the Rome formation along First Creek Gap, 4 miles (6.4 km.) north-northeast of Knoxville [Keith 1905, areal geology sheet], Knox County, Tennessee.

PLATE LXXXVIII.

PLATE LXXXVIII.

a′. Anterior adductor impressions.
a″. Posterior adductor impressions.
c. Crura.
cp. Septal plates.
d′. Cast of umbonal cavity.
j. Cardinal process.
s. Median septum.

Billingsella exporrecta (Linnarsson) (p. 754).

Figure 1. Exterior and side views of a ventral valve preserving the outer surface. U. S. Nat. Mus. Cat. No. 52249a.

1a. Exterior and side views of ventral valve, in which the plications are stronger than in the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52249b.

1b. Dorsal valve flattened in the shale. U. S. Nat. Mus. Cat. No. 52249c.

1c. Exterior and side views of rather strongly costate dorsal valve. U. S. Nat. Mus. Cat. No. 52249d.

1d and 1d′. Top, side, and back views of a cast of a somewhat quadrate ventral valve. U. S. Nat. Mus. Cat. No. 52249e.

1e. Top and side views of the cast of a transverse ventral valve. U. S. Nat. Mus. Cat. No. 52249f. Another specimen (Cat. No. 52249g) was used to restore certain portions of this figure.

1f. Interior of a dorsal valve, with strongly developed median ridge. U. S. Nat. Mus. Cat. No. 52249h.

1g. Cast of the interior of a dorsal valve, having very strongly marked muscle scars. U. S. Nat. Mus. Cat. No. 52249i.

1h. Interior of a dorsal valve with strongly marked muscle scars. U. S. Nat. Mus. Cat. No. 52249j. The specimen represented occurs on the same hand specimen with that represented by figure 1 l.

1i. Interior of a dorsal valve that should be compared with the interior represented by figure 1f. U. S. Nat. Mus. Cat. No. 52249k.

1j. Cast of the interior of a dorsal valve, with very strong muscle scars. U. S. Nat. Mus. Cat. No. 52249 l.

1k. Cast of the interior of a dorsal valve, with strong muscle scars and vascular sinuses. U. S. Nat. Mus. Cat. No. 52249m.

1 l. Cast of the interior of dorsal valve, with rather faintly marked muscle scars. U. S. Nat. Mus. Cat. No. 52249n. This specimen is associated on the same hand specimen with the specimen represented by figure 1h.

The specimens represented are all from Locality **320b**, Middle Cambrian limestones of the *Agnostus lævigatus* zone at Gudhem, 12.5 miles (20.1 km.) south-southeast of Skara, Province of Skaraborg, Sweden.

Billingsella exporrecta rugosicostata Walcott (p. 755).

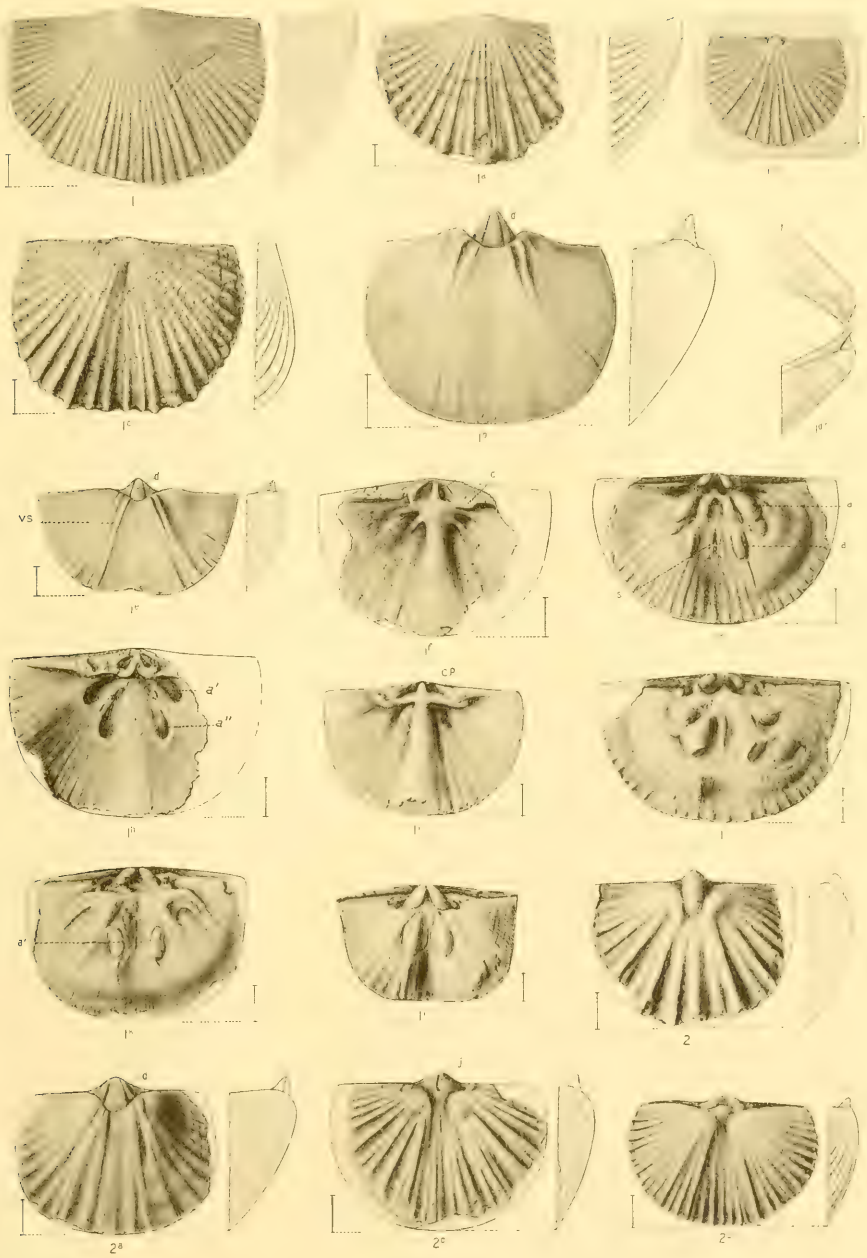
Figure 2. Top and side views of a cast of the interior of a ventral valve, the type specimen, having very strongly marked costæ. U. S. Nat. Mus. Cat. No. 52250a.

2a. Top and side views of a cast of the interior of a ventral valve, having strongly marked costæ with fine radiating striæ upon them. U. S. Nat. Mus. Cat. No. 52250b.

2b. Top and side views of a cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52250c.

2c. Top and side views of a cast of the interior of a dorsal valve less strongly costate than most specimens of this variety. U. S. Nat. Mus. Cat. No. 52250d.

The specimens represented are all from Locality **320b**, Middle Cambrian limestones of the *Agnostus lævigatus* zone at Gudhem, 12.5 miles (20.1 km.) south-southeast of Skara, Province of Skaraborg, Sweden.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

PLATE LXXXIX.

PLATE LXXXIX.

cf. Cardinal muscle scar.
d. Delthyrium.
h. Central muscle scar.
j. Anterior lateral muscle scar.
vs. Vascular sinus.

Billingsella richthofeni Walcott (p. 761).

Figure 1. Exterior of ventral valve, the type specimen, with side outline, from Locality **C3**, Lower Cambrian Manto shale, 2.5 miles (4 km.) southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52559a.

Wimanella simplex Walcott (p. 748).

[Text fig. 64, p. 748.]

Figure 2. Ventral valve from Locality **4v**, Lower Cambrian shale on Gordon Creek, 6 miles (9.6 km.) from the South Fork of the Flathead River, Ovando quadrangle (U. S. Geol. Survey), Powell County, Montana. U. S. Nat. Mus. Cat. No. 52278a. Copied from Walcott [1908d, Pl. X, fig. 2]. This is the type specimen.

2a, 2b, and 2c. Ventral valves of varying outlines owing to distortion in the shales of Locality **4w**, Lower Cambrian shales on Youngs Creek, about 5 miles (8 km.) from its junction with Danaher Creek, Ovando quadrangle (U. S. Geol. Survey), Powell County, Montana. U. S. Nat. Mus. Cat. Nos. 52277a–c, respectively.

2d. Cast of interior of ventral valve associated with the specimens represented by figures 2a–c. U. S. Nat. Mus. Cat. No. 52277d.

2e. Ventral and dorsal valves compressed and resting against each other at the posterior margins, associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52278b.

Otusia utahensis Walcott (p. 770).

Figure 3. Transverse dorsal valve, the type specimen. U. S. Nat. Mus. Cat. No. 52281a.

3a. Ventral valve with rounded cardinal angles. U. S. Nat. Mus. Cat. No. 52281b.

3b. Fragment of a dorsal valve. U. S. Nat. Mus. Cat. No. 52281c.

3c. Enlargement of outer surface. U. S. Nat. Mus. Cat. No. 52281d.

The specimens represented are from Locality **33r**, Middle Cambrian limestone in canyon about 1 mile (1.6 km.) east of Cricket Spring, Cricket Range (locally known as the Beaver River Range or the Beaver Mountains), northwest of Black Rock, Millard County, Utah.

Wynnia warthi (Waagen) (p. 771).

[Text figs. 68A and 68A′, p. 771.]

Figure 4. Cast of the interior of the ventral valve represented by figure 4b, showing faint muscle area and strong vascular sinuses. This figure is incorrect and is superseded by text figure 68A, page 771, which see. Geol. Survey India Cat. No. 4/124. The area of this specimen was figured by Waagen [1891, Pl. II, fig. 14].

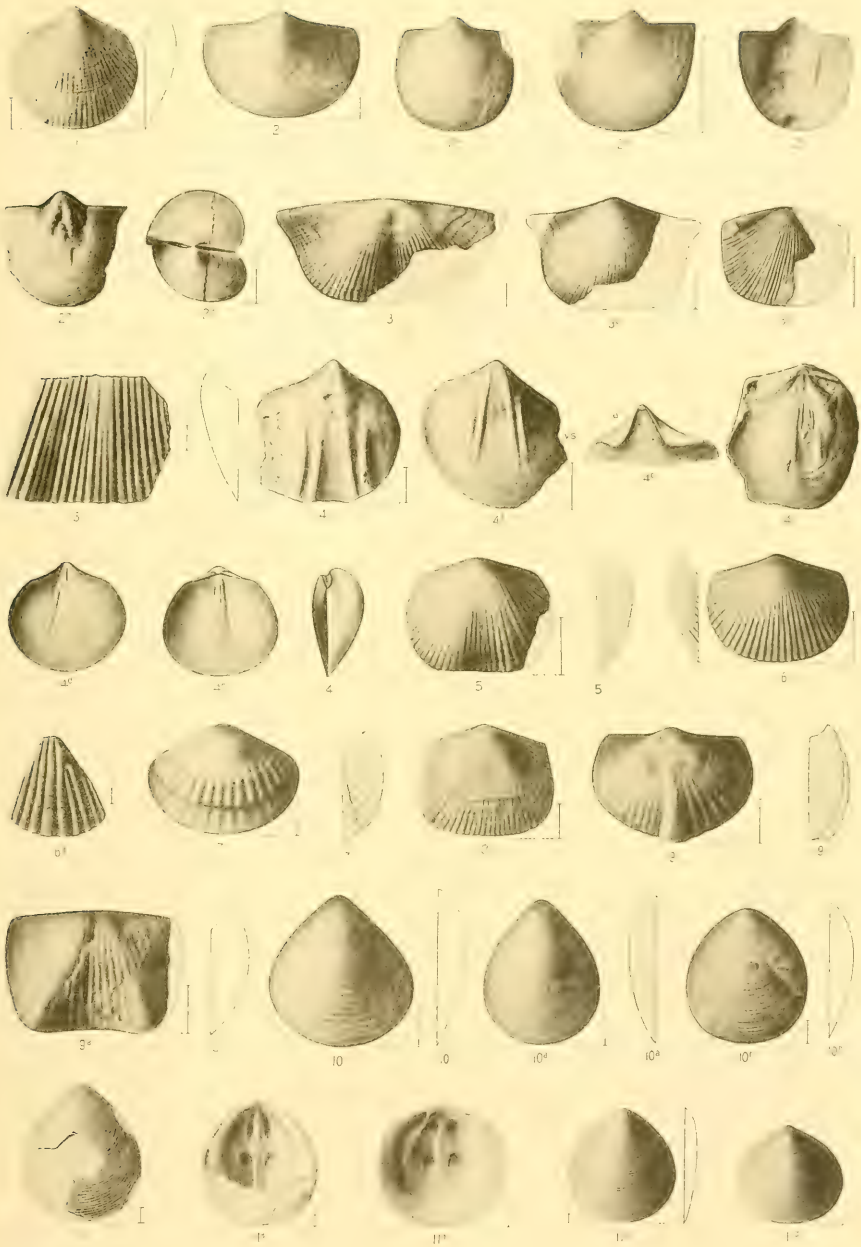
4a. Cast of the interior of another ventral valve showing faint muscle area and strong vascular sinus. Geol. Survey India Cat. No. 4/122. Type specimen figured by Waagen [1891, Pl. I, figs. 12a–b].

4b. Area of the specimen represented by figure 4. The small deltidium represented in the drawing is a mistake; there is none on the specimen. The delthyrium is much too large in the drawing owing to the breaking away of the point of the beak. The specimen is correctly represented in text figure 68A′, page 771, which see. Geol. Survey India Cat. No. 4/124. Specimen figured in this position by Waagen [1891, Pl. II, fig. 14].

4c. Cast of the interior of a dorsal valve. This valve is fitted in its proper place to the ventral valve represented by figure 4a, and the two valves probably belong to the same specimen. Geol. Survey India Cat. No. 4/122.

4d, 4e, and 4f. Diagrammatic figures of a very young individual showing the two valves united. Copied from Waagen [1891, Pl. II, figs. 2a–c].

The specimens represented are all from Locality **357d**, Middle Cambrian concretionary shales of the Khussak group at several localities between Chél Hill and Kiura (Khewra), eastern part of the Salt Range, India. The specimens represented by figures 4 and 4a likely occur in the vicinity of Chél Hill. They are all in the collection of the Geological Survey of India.



FRANCES WIESER DEL.

Eoorthis kichouensis (Walcott) (p. 782).

Figures 5 and 5′. Exterior and side views of a ventral valve, the type specimen, from Locality **C75**, Middle Cambrian limestone, Kichou formation, 4.5 miles (7.2 km.) south of Wutaihien, Shansi, China. U. S. Nat. Mus. Cat. No. 52550a.

Eoorthis agreste (Walcott) (p. 773).

Figure 6. Exterior and side views of a ventral valve, the type specimen, from Locality **C28**, Middle Cambrian Changhia limestone 1 mile (1.6 km.) east-southeast of Changhia, Shantung, China. U. S. Nat. Mus. Cat. No. 52545a.

6a. Enlargement of the radiating ribs on another specimen. U. S. Nat. Mus. Cat. No. 52545b.

Eoorthis sp. undt. c (Walcott) (p. 793).

Figure 7. Exterior and side views of a small ventral valve from Locality **C26**, Middle Cambrian Changhia limestone 2 miles (3.2 km.) north-northeast of Changhia, Shantung, China. U. S. Nat. Mus. Cat. No. 52554a.

Eoorthis sp. undt. d (Walcott) (p. 793).

Figure 8. Exterior of a ventral valve from Locality **C71**, Middle Cambrian limestone, Kichou formation, 4 miles (6.4 km.) southwest of Tungyu, Shansi, China. U. S. Nat. Mus. Cat. No. 52555a

Huenella etheridgei Walcott (p. 807).

Figures 9 and 9′. Top and side views of a dorsal valve from Locality **315c**, Middle ? Cambrian, Archæocyathinæ white limestone at Wirrialpa, Flinders Range, South Australia. Type specimen in the collection of the University of Adelaide, South Australia; cast in the United States National Museum, Cat. No. 53678b.

9a and 9a′. Top and side views of a ventral valve associated with the specimen represented by figure 9. Original in the collection of the University of Adelaide, South Australia; cast in the United States National Museum, Cat. No. 53678a.

The figures are both copied from Walcott [1908d, Pl. X, figs. 13a and 13, respectively]. They represent the specimens illustrated by Etheridge [1905, Pl. XXV, figs. 10 and 9, respectively] as *Orthis* (or *Orthisina*) sp.

Dicellomus prolificus Walcott (p. 578).

Figures 10 and 10′. Top view and side outline of a broad form of the ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 51925a. Copied from Walcott [1908d, Pl. VIII, fig. 3].

10a and 10a′. Top view and side outline of a narrow ventral valve. U. S. Nat. Mus. Cat. No. 51925c.

10b and 10b′. Top view and side outline of dorsal valve. U. S. Nat. Mus. Cat. No. 51925b. Copied from Walcott [1908d, Pl. VIII, fig. 3a].

The specimens represented are all from Locality **10z**, Middle Cambrian Marjum limestone in the long cliff about 2 miles (3.2 km.) southeast of Marjum Pass [Walcott, 1908f, p. 179 and Pls. XIII and XV], House Range, Utah.

Dicellomus parvus Walcott (p. 574).

Figure 11. Top view of partly exfoliated ventral valve. U. S. Nat. Mus. Cat. No. 52523c.

11a and 11b. Interiors of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52523a and 52523b, respectively. Copied from Walcott [1908d, Pl. VIII, figs. 2 and 2a, respectively]. Figure 11b represents the type specimen.

11c. Exterior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52523d.

11d. Exterior of a young shell. U. S. Nat. Mus. Cat. No. 52523e.

The figures represented are all from Locality **C6**, Middle Cambrian shales, Kiulung group, 2.5 miles (4 km.) southwest of Yenchuang, Sintai district, Shantung, China.

PLATE XC.

PLATE XC.

a. Cardinal area.
a′. Anterior adductor impressions.
b. Dental sockets.
c. Crura.
d′. Cast of umbonal cavity.
j. Cardinal process.
o. Ovarian areas.
vs. Vascular sinus.

Billingsella retroflexa (Matthew) (p. 761).

Figure 1. Cast of the exterior of a rather coarsely costate ventral valve. University of Toronto, Canada.

1a. Cast of the exterior of a finely costate ventral valve. University of Toronto, Canada.

1b. Cast of the exterior of a small, compressed ventral valve, with a strongly marked mesial depression. University of Toronto, Canada.

1c. Matrix of the exterior of a large dorsal valve. University of Toronto, Canada. Specimen figured by Matthew [1903, Pl. X, fig. 2d].

1d. Cast of the exterior and side outline of a dorsal valve. University of Toronto, Canada.

1e. Enlargement of the costæ and radiating striæ, as shown in the matrix of the anterior portion of the shell. University of Toronto, Canada.

1f. Cast of a partly exfoliated dorsal valve. University of Toronto, Canada.

1g. Cast of the interior of a ventral valve. University of Toronto, Canada. Specimen figured by Matthew [1895, Pl. II, fig. 1b] as *Clitambonites (Gonambonites) plana retroflexa.*

1h. Cast of a portion of the interior of a ventral valve, in which portions of the cast of the outer surface of the shell are preserved. University of Toronto, Canada. Type specimen figured by Matthew [1895, Pl. II, fig. 1a] as *Clitambonites (Gonambonites) plana retroflexa.*

The specimens represented are all from Locality **307d**, Middle Cambrian sandy limestone on Young (McFees) Point, near George River, Cape Breton, Nova Scotia.

Billingsella romingeri (Barrande) (p. 762).

Figures 2, 2a–d. Ventral, dorsal, side, front, and posterior views of the type specimen in which the two valves are united, from Locality **345f**, Middle Cambrian Étage C, near Skrej, Bohemia. Figures 2, 2a–d are copied from Barrande [1879a, Pl. LXII, figs. II: 3a, 3c, 3b, 3d, and 3e, respectively].

Figure 2e. Exterior and side views of a ventral valve. U. S. Nat. Mus. Cat. No. 52267a.

2f. Matrix of ventral valve in which the area is preserved. U. S. Nat. Mus. Cat. No. 52267b. The specimen is on the same hand fragment with the ventral valve shown in figure 2h.

2g, 2h, and 2i. Casts of the interiors and side outlines of ventral valves. U. S. Nat. Mus. Cat. Nos. 52267c, 52267d, and 52267e, respectively. The specimen represented by figure 2h is on the same hand fragment as the one shown in figure 2f.

2j. Cast of interior and side view of a dorsal valve. U. S. Nat. Mus. Cat. No. 52267f.

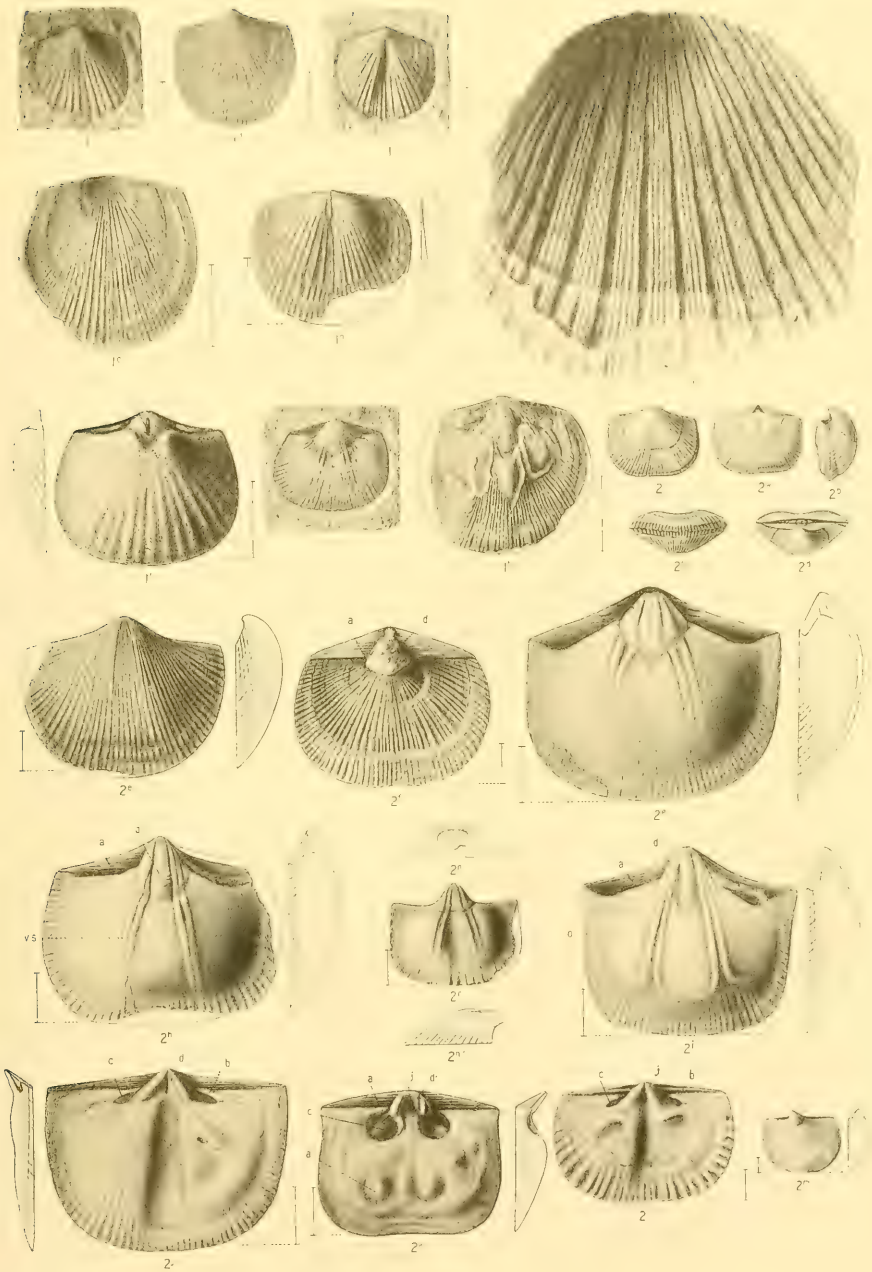
2k. Cast of the interior and side view of a dorsal valve showing very strong muscular impressions. U. S. Nat. Mus. Cat. No. 52267g.

2 l. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52267h.

2m. Cast of the interior of a very small ventral valve. U. S. Nat. Mus. Cat. No. 52267i.

2n, 2n′, and 2n″. Top, posterior, and side views of the cast of the interior of a ventral valve in which the vascular trunks are readily traced to the back of the interior of the beak. U. S. Nat. Mus. Cat. No. 52267j.

The specimens represented by figures 2e–n are from Locality **345**, Middle Cambrian shale on the Dlouhá Hora, above the brook of Sbirov, near Skrej, Bohemia.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLATE XCI.

PLATE XCI.

b. Dental sockets.
c. Crura.
d'. Cast of umbonal cavity.
j. Cardinal process.

Eoorthis remnicha (N. H. Winchell) (p. 786).

[Text fig. 7, p. 299, and Pl. XCII, figs. 2, 2a–d, 3, 3a–e.]

Figures 1, 1a, and 1b. Casts, taken in a natural mold, of ventral valves in which the costæ and mesial sinus show wide variation in form. U. S. Nat. Mus. Cat. Nos. 52361a, 52361b, and 52361c, respectively.

1c. Top view, with side and back outlines, of a natural cast of part of the interior of a ventral valve. The tripartite division of the interior of the shell (visceral area) opposite the deltidium is finely shown. U. S. Nat. Mus. Cat. No. 52361d.

1d. Natural cast of the interior of a ventral valve, with strong rounded costæ. U. S. Nat. Mus. Cat. No. 52361e.

1e. Natural cast of the interior of a ventral valve, with fine costæ and short auriculate extension of the cardinal angles. U. S. Nat. Mus. Cat. No. 52361f.

1f and 1g. Natural casts of small finely costate ventral valves, with slightly auriculate cardinal angles. U. S. Nat. Mus. Cat. Nos. 52361g and 52361h, respectively.

1h. Natural cast of strongly costate ventral valve, with short cardinal line. Locality **80a**, Upper Cambrian "St. Croix sandstone" 4 miles (6.4 km.) north of Reedsburg, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. No. 52362a.

1i. Cast in natural mold of a ventral valve, with short cardinal line, strong costæ, and median sinus. U. S. Nat. Mus. Cat. No. 52361i.

1j. Natural cast of a small ventral valve, with very strong costæ. U. S. Nat. Mus. Cat. No. 52361j.

1k. Natural cast of a ventral valve, with fine costæ interspaced between strong costæ. U. S. Nat. Mus. Cat. No. 52361k.

1l. Natural cast of a ventral valve, with strong costæ much like those of figure 1d. A gradation of the strength of the costæ is noticeable from figure 1l through figures 1d, 1j, 1b, 1c, 1h, 1f, and 1g. The specimen represented by figure 1l is associated with the ventral valve shown in figure 1h. U. S. Nat. Mus. Cat. No. 52362b.

1m, 1n, 1o, 1p, and 1q. Natural casts of dorsal valves, showing variation in form and strength of surface costæ. U. S. Nat. Mus. Cat. Nos. 52361l–p, respectively.

1r. Enlargement of the posterior portion of figure 1q. U. S. Nat. Mus. Cat. No. 52361p.

1s. Enlargement of the surface of a ventral valve from Locality **12n**, Upper Cambrian limestone of the Reagan sandstone, sec. 1, T. 2 S., R. 1 E., Ardmore quadrangle (U. S. Geol. Survey), Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52356a.

With the exception of figures 1h, 1l, and 1s the specimens represented are all from Locality **97a**, Upper Cambrian "St. Croix sandstone" near Winfield, Jefferson County, Wisconsin.

Eoorthis remnicha winfieldensis (Walcott) (p. 788).

Figure 2. Exterior and side views of a cast in a natural mold of the exterior surface of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52374a.

2a, 2b, and 2c. Three natural casts of ventral valves that illustrate variation in form. U. S. Nat. Mus. Cat. Nos. 52374b, 52374c, and 52374d, respectively.

2d. Exterior and side views of natural cast of exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52374e.

2e. Exterior, side, and back views of natural cast of a dorsal valve. U. S. Nat. Mus. Cat. No. 52374f.

The specimens represented are all from Locality **97a**, Upper Cambrian "St. Croix sandstone" near Winfield, Jefferson County, Wisconsin.

Eoorthis iddingsi (Walcott) (p. 780).

Figure 3. Ventral valve. The outline is partly restored from another shell. U. S. Nat. Mus. Cat. No. 52340a. Type specimen figured by Walcott [1899, Pl. LXII, fig. 1a] as *Eoorthis remnicha*.

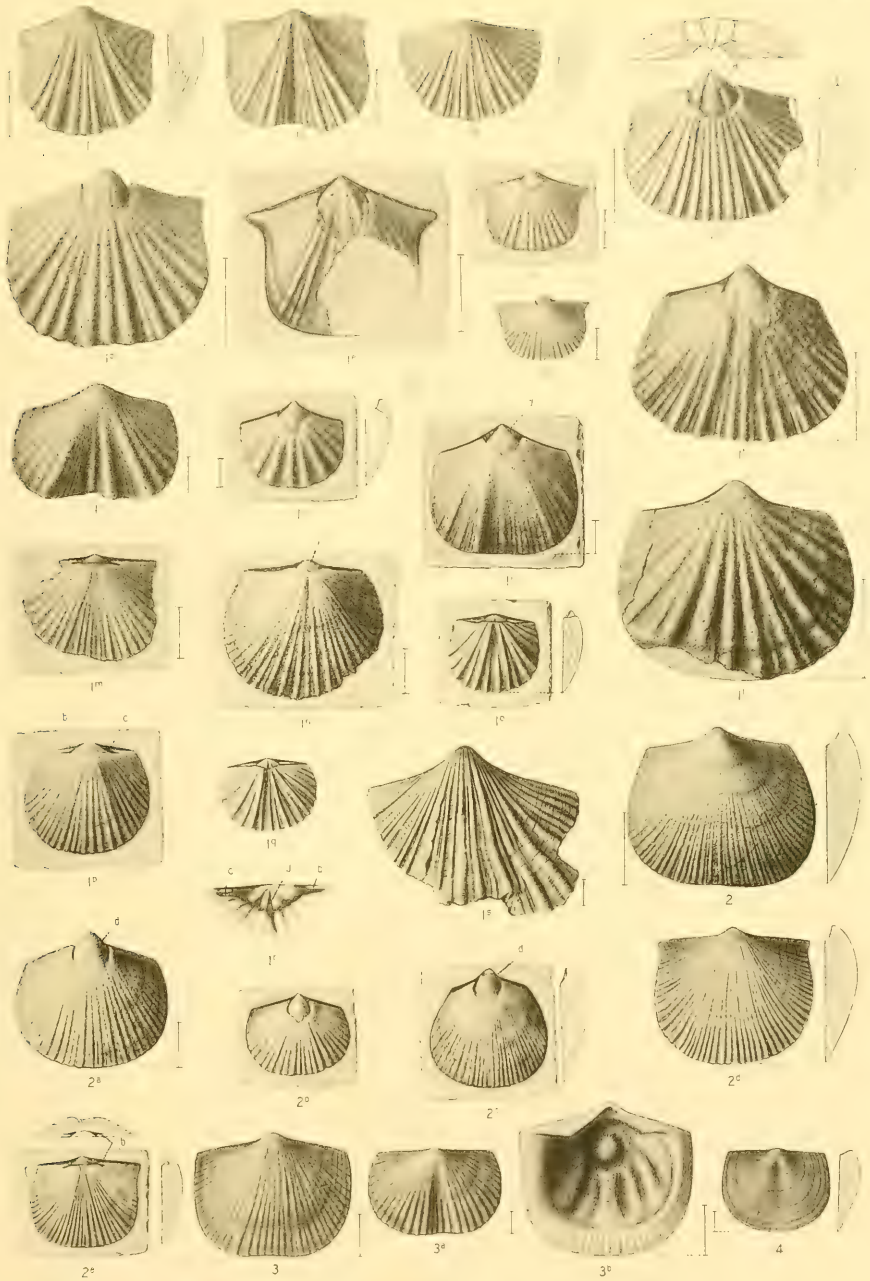
3a. A small dorsal valve. U. S. Nat. Mus. Cat. No. 52340b. Specimen figured by Walcott [1899, Pl. LXII, fig. 1b] as *Eoorthis remnicha*.

3b. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52340c.

The specimens represented are all from Locality **302c**, Upper Cambrian shaly limestone on south side of Gallatin Valley, Yellowstone National Park, Wyoming.

Eoorthis papias (Walcott) (p. 785).

Figure 4. Top and side views of the type and only specimen of the species in the collection. Locality **61**, Middle Cambrian shales near the top of No. 6 of the Manuels Brook section [Walcott, 1891b, p. 261], east side of Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 52353a.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLATE XCII.

PLATE XCII.

b. Dental sockets.
c. Crura.
d'. Umbonal cavity.
j. Cardinal process.

Eoorthis remnicha sulcata (Walcott) (p. 787).

Figures 1 and 1b. Natural cast of dorsal valves from Locality **97a**, Upper Cambrian sandstone near Winfield, Jefferson County, Wisconsin. U. S. Nat. Mus. Cat. Nos. 52365a and 52365b, respectively.

1a and 1c. Natural casts of dorsal valves from Locality **80a**, Middle Cambrian sandstone 4 miles (6.4 km.) north of Reedsburg, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. Nos. 52366a and 52366b, respectively. Figure 1a represents the type specimen.

Eoorthis remnicha (N. H. Winchell) (p. 786).

[Text fig. 7, p. 299, and Pl. XCI, figs. 1, 1a–s.]

Figure 2. Exterior of dorsal valve from Locality **302b**, Middle Cambrian limestones near Crowfoot Ridge, Yellowstone National Park, Wyoming. U. S. Nat. Mus. Cat. No. 35215a. Specimen figured by Walcott [1899, Pl. LXII, fig. 1].

2a. Interior of ventral valve from Locality **302n**, Upper Cambrian limestone on south side of Gallatin Valley, Gallatin County, Montana. U. S. Nat. Mus. Cat. No. 52354a. Specimen figured by Walcott [1899, Pl. LXI, fig. 3a].

2b. Interior of dorsal valve associated with the specimen represented by figure 2a. U. S. Nat. Mus. Cat. No. 52354b. Specimen figured by Walcott [1899, Pl. LXI, fig. 3].

2c. Enlargement of exterior of a ventral valve associated with the specimen represented by figure 2, showing fine radiating striæ. U. S. Nat. Mus. Cat. No. 35215b. Specimen figured by Walcott [1899, Pl. LXII, fig. 1d].

2d. Ventral and dorsal valves associated with the specimen represented by figure 2a, showing fine radiating striæ. U. S. Nat. Mus. Cat. No. 52354c. Specimen figured by Walcott [1899, Pl. LXII, fig. 1c].

3; 3a, 3a′, 3a″; and 3c. Three ventral valves illustrating variation in form and costæ. The fine radiating striæ so characteristic of the specimens represented by figures 2c and 2d are largely exfoliated with the matrix. A few traces of the striæ are shown by figure 3a. Locality **12k**, Upper Cambrian limestone of the Reagan sandstone, sec. 35, T. 1 S., R. 1 E., Ardmore quadrangle, Carter County, Oklahoma. U. S. Nat. Mus. Cat. Nos. 52355a, 52355b, and 52355c, respectively.

3b. Ventral valve from Locality **12n**, Upper Cambrian limestone of the Reagan sandstone, sec. 1, T. 2 S., R. 1 E., Ardmore quadrangle, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52356b.

3d. Broad form of dorsal valve associated with the specimen represented by figure 3b. U. S. Nat. Mus. Cat. No. 52356c.

3e. Elongate form of dorsal valve associated with the specimen represented by figure 3. U. S. Nat. Mus. Cat. No. 52355d.

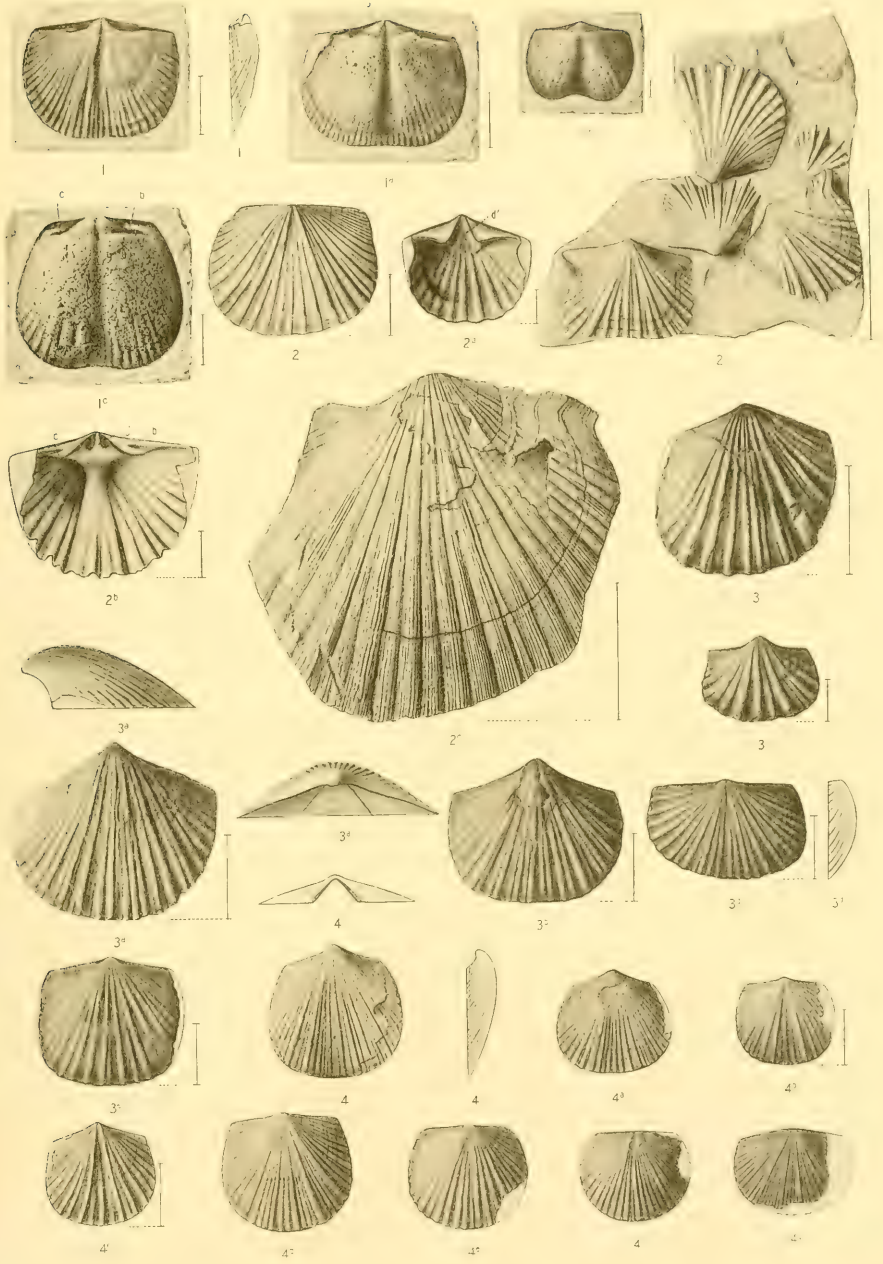
Eoorthis remnicha texana (Walcott) (p. 787).

Figures 4, 4′; 4a; and 4b. Three ventral valves, varying in form and surface characters, from Locality **71**, Upper Cambrian limestone in Cold Creek Canyon, Burnet County, Texas. U. S. Nat. Mus. Cat. Nos. 52369a, 52369b, and 52369c, respectively. Figure 4 represents the type specimen.

4″. Back view of a large ventral valve associated with the specimen represented by figure 4c. The specimen can not be located. U. S. Nat. Mus. Cat. No. 52370b.

4c. Dorsal valve from Locality **12m**, Upper Cambrian Arbuckle limestone, sec. 2, T. 2 S., R. 1 E., Ardmore quadrangle, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52370a.

4d, 4e, 4f, and 4g. Dorsal valves, varying in form and surface characters, associated with the specimens represented by figures 4, 4a–b. U. S. Nat. Mus. Cat. Nos. 52369d–g, respectively.



FRANCES WIESER DEL.

PLATE XCIII.

PLATE XCIII.

a. Cardinal area.
a′. Anterior adductor impressions.
a″. Posterior adductor impressions.
b. Dental sockets.
d. Delthyrium.
d′. Cast of umbonal cavity.
j. Cardinal process.
r. } Vascular markings.
r′. }
sp. Free spondylium or cast of it.
t. Teeth.
vs. Vascular sinus.

Finkelnburgia osceola (Walcott) (p. 795).

Figures 1 and 1b. Natural casts of ventral valves from Locality **78**, Upper Cambrian sandstone in quarry near St. Croix River, in suburbs of Osceola, Polk County, Wisconsin. U. S. Nat. Mus. Cat. Nos. 52413a and 52413b, respectively.

1a. Natural cast of ventral valve from Locality **79b**, Upper Cambrian sandstone near Hudson, St. Croix County, Wisconsin. U. S. Nat. Mus. Cat. No. 52415a.

1c and 1d, 1d′, and 1d″. Casts of the interior of a dorsal and a ventral valve from Locality **83**[1], Upper Cambrian sandstone near Trempealeau, Trempealeau County, Wisconsin. U. S. Nat. Mus. Cat. Nos. 52412a and 52412b, respectively. Figure 1d represents the type specimen.

1e. Natural mold of exterior of dorsal valve associated with the specimens represented by figures 1c and 1d. U. S. Nat. Mus. Cat. No. 52412c.

1f. Cast of interior of dorsal valve that shows casts of what may have been the points of attachment of the adductor muscles, associated with the specimens represented by figures 1c and 1d. U. S. Nat. Mus. Cat. No. 52412d.

1g. Cast of the interior of dorsal valve associated with the specimens represented by figures 1c and 1d. U. S. Nat. Mus. Cat. No. 52412e.

1h. Imperfect cast of the interior of a dorsal valve from Locality **79a**, Upper Cambrian sandstone at Menomonie, Dunn County, Wisconsin. U. S. Nat. Mus. Cat. No. 52414a.

Finkelnburgia finkelnburgi (Walcott) (p. 794).

Figure 2. Cast of interior of ventral valve, the type specimen. What may be the cast of the base of the vascular trunks is shown (vs). U. S. Nat. Mus. Cat. No. 52410a.

2a. Cast of interior of ventral valve, with outline of posterior view, showing area of adductor scars (a′). U. S. Nat. Mus. Cat. No. 52410b.

2b. Cast of the interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52410c.

2c. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52410d.

2d. Cast of the interior of a ventral valve with the bases of very large vascular sinuses. U. S. Nat. Mus. Cat. No. 52410e.

2e. Cast of interior of dorsal valve, with back and side outlines. U. S. Nat. Mus. Cat. No. 52410f.

The specimen represented by figure 2 is from Locality **83**, and those by figures 2a–c are from Locality **83**[1], a slightly lower horizon, both in the Upper Cambrian sandstone near Trempealeau, Trempealeau County, Wisconsin.

Eoorthis? diablo (Walcott) (p. 778).

Figure 3. Cast of interior of ventral valve, the type specimen, from Locality **81b**, Upper Cambrian sandstone near Devils Lake, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. No. 52334a.

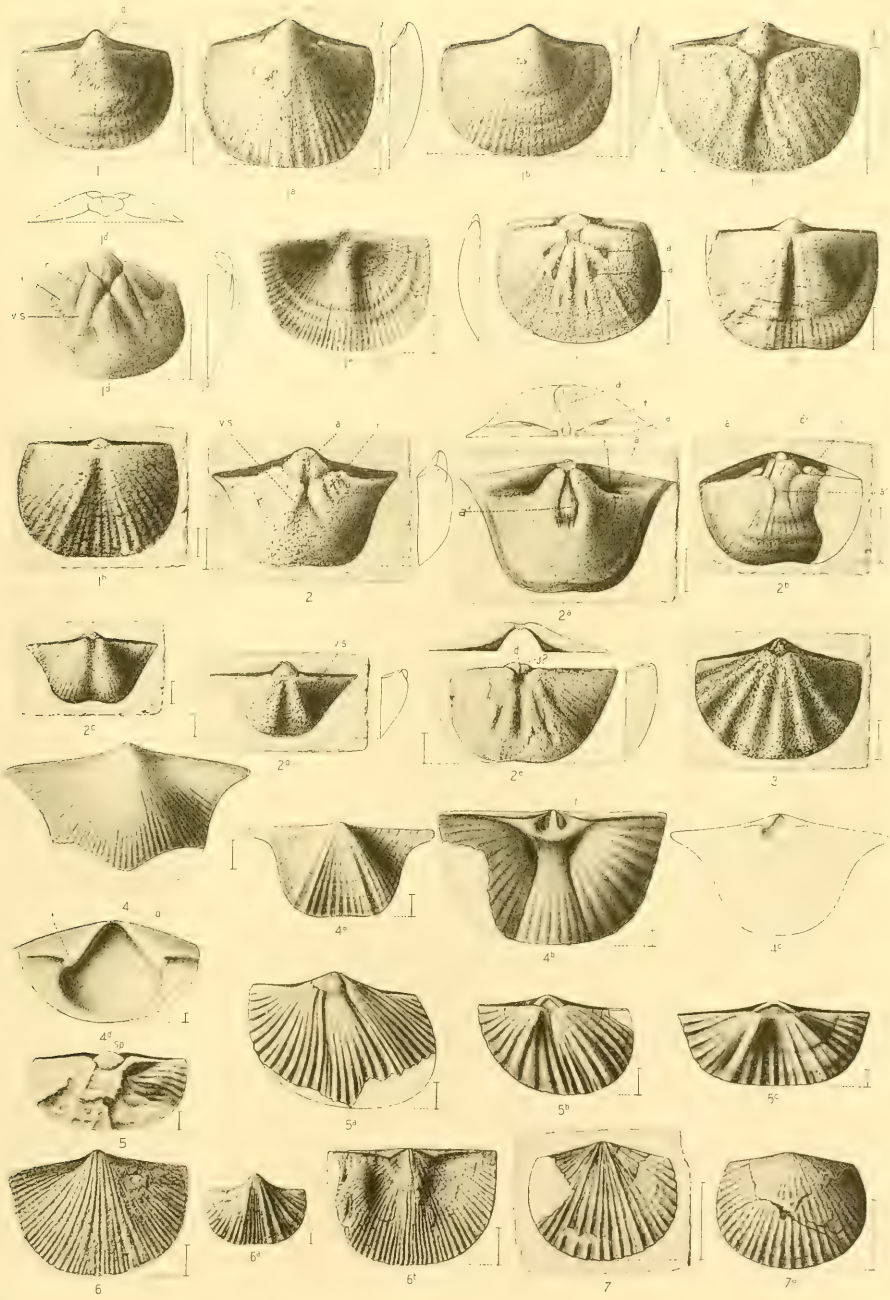
Otusia sandbergi (N. H. Winchell) (p. 769).

Figures 4 and 4a. Exterior of ventral valves. U. S. Nat. Mus. Cat. Nos. 35214a and 35214b, respectively.

4b. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 35214c.

4c and 4d. Interior of the posterior part of a ventral valve. U. S. Nat. Mus. Cat. No. 35214d.

The specimens represented are all from Locality **302f**, Upper Cambrian limestone on north side of Elk Pass, Yellowstone National Park, Wyoming.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

Protortiiis wingi Walcott (p. 743).

Figure 5. Distorted cast of interior of ventral valve. U. S. Nat. Mus. Cat. No. 52437a.

5a. Distorted ventral valve, the type specimen, compressed in argillaceous shale. U. S. Nat. Mus. Cat. No. 52437b.

5b and 5c. Casts of distorted dorsal valves. U. S. Nat. Mus. Cat. Nos. 52437c and 52437d, respectively.

The specimens represented are all from Locality **28**, Upper Cambrian shales about 100 feet above the *Olenellus* horizon south of Highgate Falls, 0.25 mile (0.4 km.) east of Swanton, Franklin County, Vermont.

Nisusia (Jamesella) nautes (Walcott) (p. 734).

Figures 6 and 6a. Exterior of ventral valves compressed and distorted in argillaceous shale of Locality **163**, Middle Cambrian Spence shale member of the Ute limestone in Spence Gulch, 15 miles (24.2 km.) west of Montpelier, Bear Lake County, Idaho. U. S. Nat. Mus. Cat. Nos. 52432a and 52432b, respectively. Figure 6 represents the type specimen.

6b. Interior of dorsal valve associated with specimens represented by figures 6 and 6a. U. S. Nat. Mus. Cat. No. 52432c.

Nisusia (Jamesella) spencei (Walcott) (p. 737).

[Text fig. 62, p. 737.]

Figure 7. Compressed ventral valve, from Locality **11q**, Middle Cambrian limestone in 1c of the Marjum limestone, in ridge east of Wheeler Amphitheater, House Range, Utah. U. S. Nat. Mus. Cat. No. 52436a.

7a. Compressed ventral valve, from Locality **163**, Middle Cambrian Spence shale member of the Ute limestone in Spence Gulch, 15 miles (24.2 km.) west of Montpelier, Bear Lake County, Idaho. U. S. Nat. Mus. Cat. No. 52435b. This is the type specimen.

PLATE XCIV.

PLATE XCIV.

Eoorthis wichitaensis (Walcott) (p. 790).

[Pl. XCIV, fig. 1u.]

Figures 1 and 1′. Exterior of ventral valve, the type specimen, and view of area, from Locality **12p**, Upper Cambrian limestones, at the northwest extremity of the Arbuckle Mountains, about 4 miles (6.4 km.) east of Homer, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52384a.

1a and 1a′. Exterior of ventral valve showing slight mesial fold, with side view. Locality **12k**, Upper Cambrian limestones in sec. 35, T. 1 S., R. 1 E., Ardmore quadrangle, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52383a.

1b and 1b′. Exterior of ventral valve associated with the specimen represented by figure 1, showing flattened mesial area. U. S. Nat. Mus. Cat. No. 52384b.

1c and 1c′. Exterior of ventral valve associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. No. 52383b.

1d. Exterior of ventral valve from Locality **71**, Middle Cambrian limestone in Cold Creek Canyon, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 52379a.

1e. Ventral valve partly exfoliated posteriorly so as to show cast of muscle area, associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52384c.

1f. Exterior of ventral valve, with straight cardinal slopes, associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. No. 52384d.

1g and 1h, 1h′. Exterior views of two dorsal valves illustrating variation in form and surface characters, associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 52384e and 52384f, respectively.

1i. Exterior of dorsal valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 52379b.

1j, 1j′, and 1k. Exteriors of two dorsal valves associated with the specimen represented by figure 1a. U. S. Nat. Mus. Cat. Nos. 52383c and 52383d, respectively.

1l and 1m. Dorsal valves associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 52384g and 52384h, respectively.

1n. Dorsal valve from Locality **12n**, Upper Cambrian limestones in sec. 1, T. 2 S., R. 1 E., Ardmore quadrangle, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52381a.

1o. Cast of interior of a dorsal valve from Locality **68**, Upper Cambrian limestone in Packsaddle Mountain, Llano County, Texas. U. S. Nat. Mus. Cat. No. 52382a.

Eoorthis wichitaensis læviusculus (Walcott) (p. 791).

Figures 1p, 1q, 1r, and 1s. Ventral, dorsal, side, and posterior views of the type specimen, a complete shell free from matrix, from Locality **12p**, Upper Cambrian limestones, at the northwest extremity of the Arbuckle Mountains, about 4 miles (6.4 km.) east of Homer, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52396a.

Eoorthis indianola (Walcott) (p. 780).

[Pl. XCIV, figs. 2, 2a–h.]

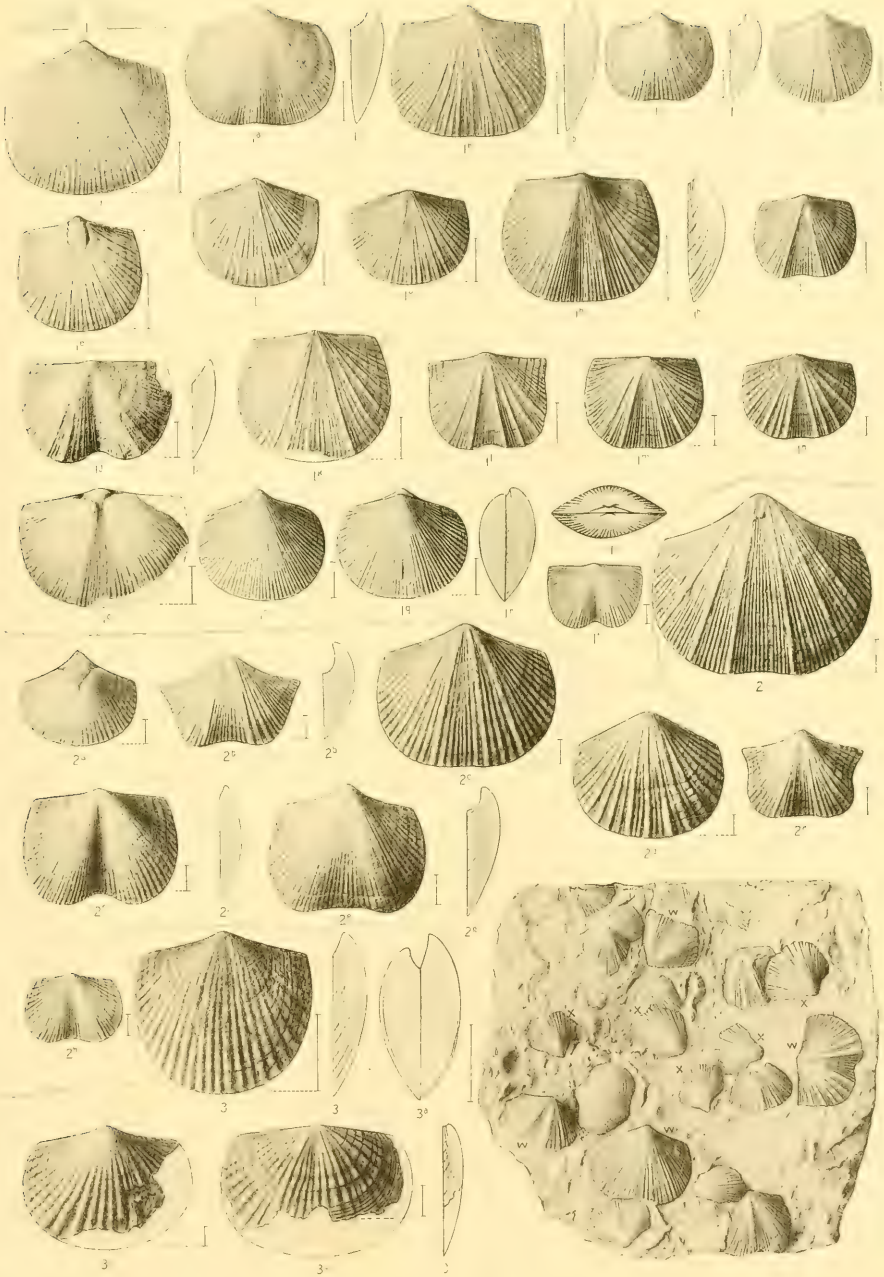
Figure 1t. Dorsal valve from Locality **12k**, Upper Cambrian limestones, Ardmore quadrangle, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52343a.

Figure 1u. Fragment of limestone from Locality **14b**, Upper Cambrian limestone on Cold Creek, Llano County, Texas, illustrating association of forms of *Eoorthis wichitaensis* (W) and *Eoorthis indianola* (X). U. S. Nat. Mus. Cat. No. 52380a.

Eoorthis wichitaensis (Walcott) (p. 790).

[Pl. XCIV, figs. 1, 1a–o.]

Figure 1u. Fragment of limestone from Locality **14b**, Upper Cambrian limestone on Cold Creek, Llano County, Texas, illustrating association of forms of *Eoorthis wichitaensis* (W) and *Eoorthis indianola* (X). U. S. Nat. Mus. Cat. No. 52380a.



FRANCES WIESER DEL.

HELIOTYPE CO BOSTON

Eoorthis indianola (Walcott) (p. 780).

[Pl. XCIV, figs. 1t–u.]

Figure 2. Exterior of a ventral valve, the type specimen, enlarged to show surface costæ and striæ. U. S. Nat. Mus. Cat. No. 52343b.

2a. Exfoliated ventral valve showing cast of visceral area. Locality **12p**, Upper Cambrian limestones at the northwest extremity of the Arbuckle Mountains, about 4 miles (6.4 km.) east of Homer, Carter County, Oklahoma. U. S. Nat. Mus. Cat. No. 52342a.

2b, 2b′; 2c, 2d, and 2e. Exterior of four ventral valves that vary in form and surface characters. U. S. Nat. Mus. Cat. No. 52343c–f, respectively.

2f and 2f′. Exterior and side outline of dorsal valve. U. S. Nat. Mus. Cat. No. 52343g.

2g and 2g′. Ventral valve associated with the specimen represented by figure 2a. U. S. Nat. Mus. Cat. No. 52342b.

2h. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52343h.

With the exception of figures 2a and 2g the specimens represented are all from Locality **12k**, Upper Cambrian limestones in sec. 35, T. 1 S., R. 1 E., Ardmore quadrangle, Carter County, Oklahoma.

Eoorthis hastingsensis (Walcott) (p. 779).

Figures 3 and 3′. Exterior view and side outline of ventral valve from Locality **21**, Middle Cambrian limestone at the base of the *Paradoxides* zone on Hanford Brook, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52337a. This is the type specimen.

3a. Diagrammatic outline of a vertical median section through the united valves of a specimen associated with the ventral valve represented by figure 3. U. S. Nat. Mus. Cat. No. 52337b.

3b and 3c, 3c′. View of exterior of ventral and dorsal valves, with side outline of dorsal valve, from Locality **2s**, Middle Cambrian limestone, at Hastings Cove, on Kennebecasis Bay, northeast of St. John, New Brunswick. U. S. Nat. Mus. Cat. Nos. 52336a and 52336b, respectively.

PLATE XCV.

PLATE XCV.[a]

a'. Anterior adductor scars.
a''. Posterior adductor scars.
b. Dental sockets.
c. Crura.
j. Cardinal process.
r. Diductor scars.

Eoorthis christianlæ (Kjerulf)[a] (p. 775).

Figure 1. Cast of exterior of ventral valve. U. S. Nat. Mus. Cat. No. 52306h.

1a, 1b, and 1c. Casts of ventral valves showing muscular area. U. S. Nat. Mus. Cat. Nos. 52306a–c, respectively.

1d, 1e, and 1f. Casts of exterior of dorsal valves. U. S. Nat. Mus. Cat. Nos. 52306d–f, respectively.

1g. Cast of interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52306g.

The specimens represented by figures 1, 1a–g are from Locality **310d**, Upper Cambrian *Ceratopyge* slate at Borgholm, Oeland Island, Sweden.

Figure 1h. Dorsal valve with strong median sinus, from Locality **323x**, Upper Cambrian *Ceratopyge* slate at Russelökken, near Christiania, Norway. U. S. Nat. Mus. Cat. No. 52307a.

Eoorthis daunus (Walcott)[a] (p. 776).

Figure 2. Ventral valve with side outline from Locality **310j**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 52309a.

2a and 2b. Dorsal valves in limestone matrix of Locality **323z**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at Töien, near Christiania, Norway. U. S. Nat. Mus. Cat. Nos. 52308a and 52308b, respectively. Figure 2a represents the type specimen.

2c. Dorsal valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52309b.

Eoorthis tullbergi (Walcott)[a] (p. 790).

Figure 3. Partly exfoliated ventral valve, the type specimen, from Locality **390**, passage beds between the Upper Cambrian and the Ordovician, at Alunbruk (alum works), Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 58309.

Eoorthis wimani (Walcott)[a] (p. 791).

Figure 4. Cast of interior of ventral valve from Locality **8x**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at Slemmestad, about 3 miles (4.8 km.) southwest of Christiania, Norway. U. S. Nat. Mus. Cat. No. 52311a.

4a. Cast of interior of dorsal valve, the type specimen, from Locality **323w**, Upper Cambrian black argillaceous shale of "Étage 3aβ" at Christiania, Norway. U. S. Nat. Mus. Cat. No. 52313a.

4b. Exfoliated dorsal valve from Locality **310j**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at Borgholm, Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 52312a.

4c and 4d. Ventral and dorsal valves associated with the specimen represented by figure 4a. U. S. Nat. Mus. Cat. Nos. 52313b and 52313c, respectively.

Protorthis? hunnebergensis Walcott[a] (p. 740).

Figure 5. Cast in shale of exterior of ventral valve. U. S. Nat. Mus. Cat. No. 52428a.

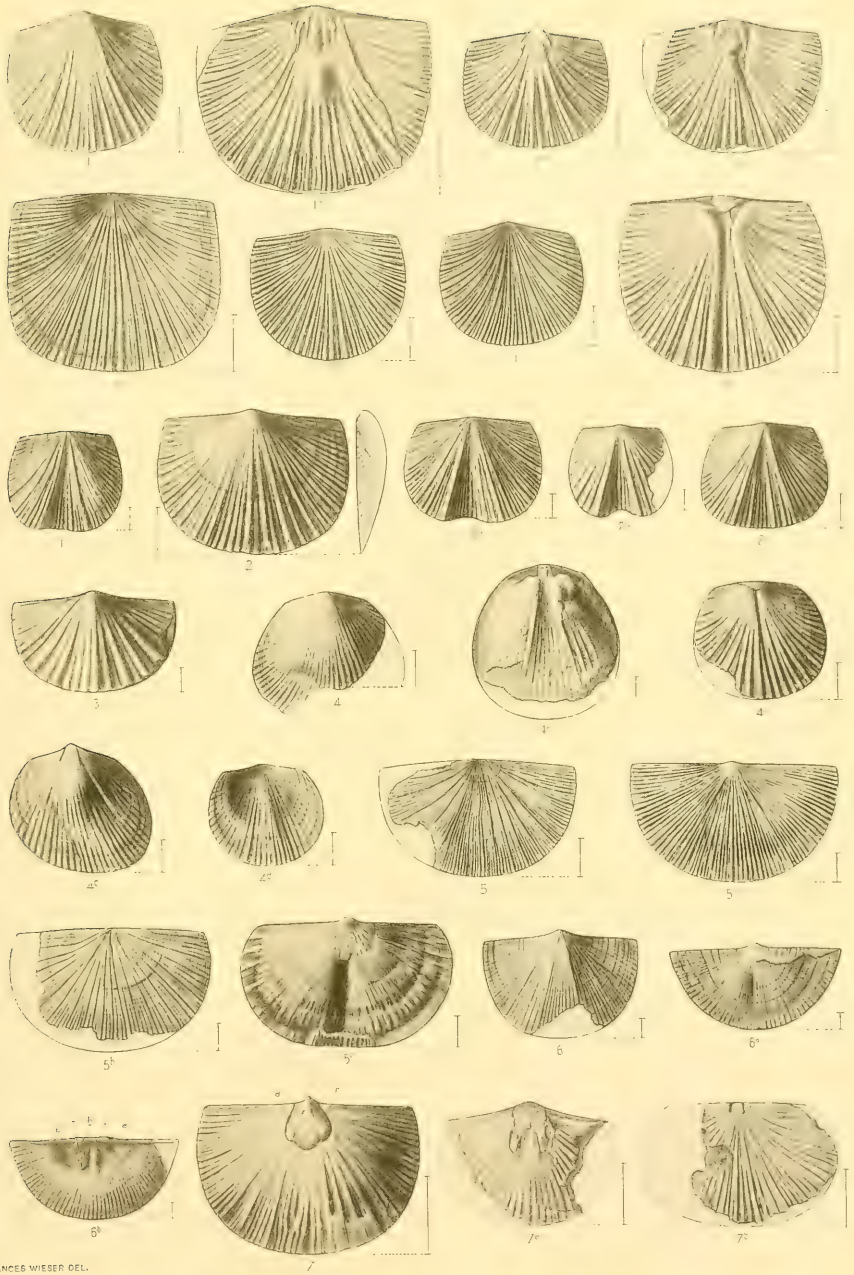
5a. Cast of compressed ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52428b.

5b. Cast in shale of exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52428c.

5c. Partial cast of interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52428d.

The specimens represented are all from Locality **390f**, passage beds between the Upper Cambrian and the Ordovician, shales at Mossebo, on Hunneberg, Province of Skaraborg, Sweden.

[a] A photograph of this plate was sent to Prof. J. C. Moberg, who reproduced it as Plate II of his paper on the *Ceratopyge* region [Moberg and Segerberg, 1906, Pl. II].



FRANCES WIESER DEL.

Eostrophomena elegantula (Walcott)[a] (p. 796).

Figure 6. Exterior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52316a.
6a. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52316b.
6b. Cast of interior of dorsal valve. All elevations and depressions are the reverse of their actual occurrence in the interior of the shell. U. S. Nat. Mus. Cat. No. 52316c.

The specimens represented are all from Locality **310j**, passage beds between the Upper Cambrian and the Ordovician, *Ceratopyge* limestone at Borgholm, Oeland Island, Sweden.

Eoorthis atava (Matthew)[a] (p. 774).

Figures 7 and 7a. Ventral valves. Figure 7 represents the type specimen.
7b. Dorsal valve.

The specimens represented are all from Locality **308a**, Upper Cambrian shales of Division C3a of Matthew at Navy Island, St. John Harbor, St. John, New Brunswick. The figures (7, 7a–b) are redrawn from the specimens illustrated by Matthew [1893, Pl. VII, figs. 8c, 8a, and 8b, respectively].

[a] A photograph of this plate was sent to Prof. J. C. Moberg, who reproduced it as Plate II of his paper on the *Ceratopyge* region [Moberg and Segerberg, 1906, Pl. II].

PLATE XCVI.

PLATE XCVI.

c. Crura.
j. Cardinal process.
t. Teeth.
ps. Pseudospondylium.
s. Median septum,

Eoorthis desmopleura (Meek) (p. 777).

Figures 1; 1a, 1a′; 1b; and 1c. Exterior and side views of four ventral valves, illustrating variation in form and surface characters. Locality **187**, Lower Ordovician red siliceous limestone 105–122 feet above the pre-Cambrian, 2 miles (3.2 km.) below Manitou Park Hotel, El Paso County, Colorado. U. S. Nat. Mus. Cat. Nos. 52317a–d, respectively.

1d and 1e. Cast of ventral valve associated with the specimen represented by figure 1, with side outline, showing area and cast of umbonal cavity. U. S. Nat. Mus. Cat. No. 52317e.

1f and 1g. Dorsal valves associated with the specimen represented by figure 1. U. S. Nat. Mus. Cat. Nos. 52317f and 52317g, respectively.

1h. Silicified shell showing character of radiating costæ and striæ. This is the type specimen, from Locality **360f**, Lower Ordovician siliceous limestone at Glen Eyre, Camp Creek Canyon, near Manitou, El Paso County, Colorado. U. S. Nat. Mus. Cat. No. 7859a.

1i and 1j. Top and side views of ventral valves from Locality **14k**, Upper Cambrian limestone on Wolf Creek, 15 miles (24.2 km.) west-southwest of Sheridan, Sheridan County, Wyoming. U. S. Nat. Mus. Cat. Nos. 52320a and 52320b, respectively.

1k and 1l. Exterior of dorsal valves associated with the dorsal valves represented by figures 1i and 1j. U. S. Nat. Mus. Cat. Nos. 52320c and 52320d, respectively.

1m and 1n. Exterior of small ventral valves. U. S. Nat. Mus. Cat. Nos. 52319a and 52319b, respectively.

1o. Exterior of a ventral valve. U. S. Nat. Mus. Cat. No. 52319c.

1p. Side view of a young, convex shell. U. S. Nat. Mus. Cat. No. 52319d.

1q. Posterior portion of the interior of an abraded ventral valve. U. S. Nat. Mus. Cat. No. 52319e.

1r. Interior of an abraded dorsal valve. U. S. Nat. Mus. Cat. No. 52319f.

The specimens represented by figures 1m–r are from Locality **168**, Middle Cambrian limestones on Tepee Creek, near the road from Sheridan to Dome Lake, Bighorn Mountains, Wyoming.

Eoorthis desmopleura nympha (Walcott) (p. 778).

Figure 2. Exterior and side views of a ventral valve, the type specimen, from Locality **168**, Middle Cambrian limestones on Tepee Creek, near the road from Sheridan to Dome Lake, Bighorn Mountains, Wyoming. U. S. Nat. Mus. Cat. No. 52333a.

Plectorthis whitfieldi (N. H. Winchell) (p. 308).

Figure 3. Interior of a ventral valve, showing the relatively high area and strong teeth, the outline of the pseudospondylium, and the low ridges extending forward and outward from its anterior margin. Ordovician, Spring Valley, Minnesota. Copied from Hall and Clarke [1892c, Pl. V, fig. 26].

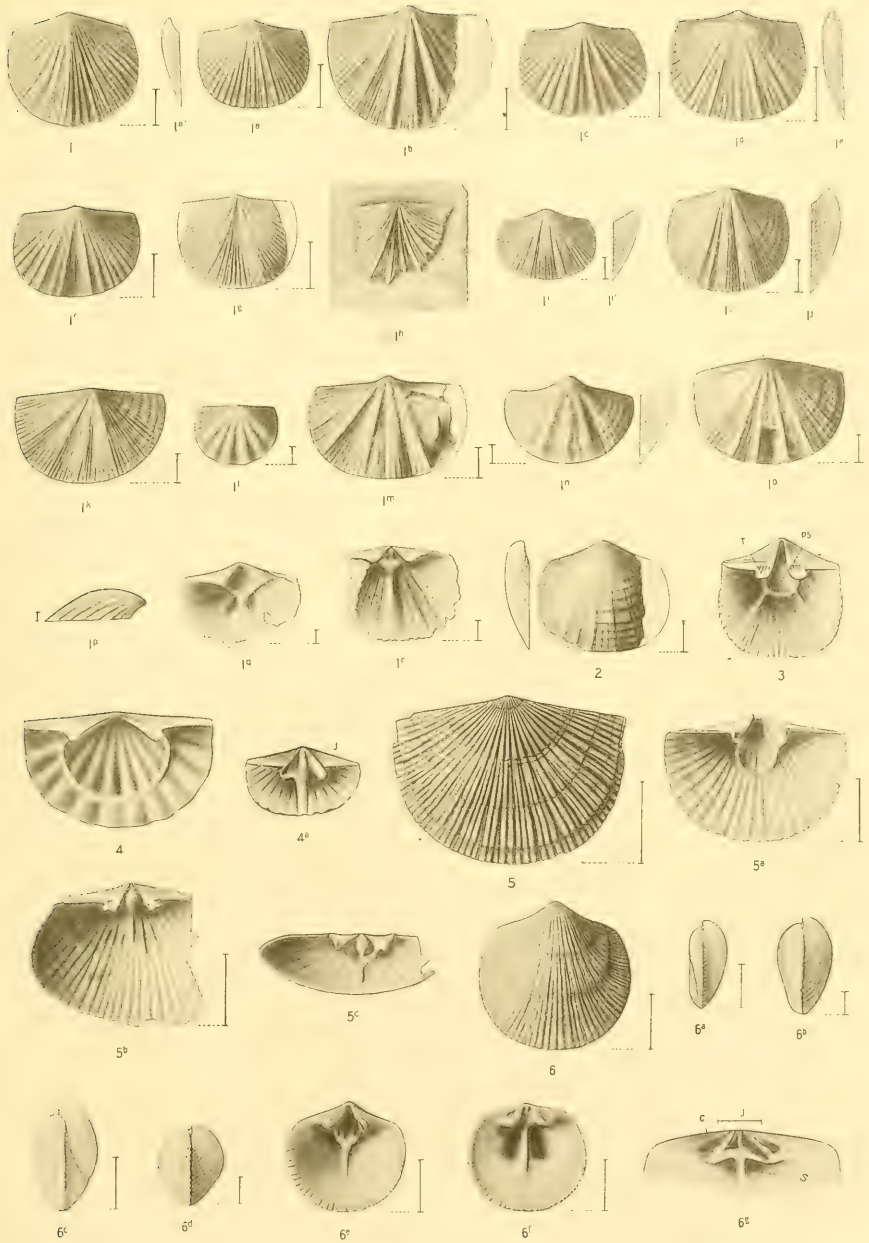
Plectorthis plicatella (Hall) (p. 772).

[Text fig. 12, p. 299.]

Figure 4. Posterior portion of the interior of a ventral valve, showing the broad delthyrium, teeth, and the outline of the pseudospondylium.

4a. The area of the dorsal valve, showing the triangular delthyrium, cardinal process, crural plates, and low narrow median ridge.

The specimens represented are all from the Ordovician at Covington, Kentucky. The figures are copied from Hall and Clarke [1892c, Pl. V, figs. 19 and 20].



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

PLECTORTHIS JAMESI (Hall) (p. 772).

FIGURE 5. Exterior of a ventral valve. U. S. Nat. Mus. Cat. No. 51307a.
5a. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 51307b.
5b. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 51307c.
5c. View of the interior of the specimen represented by figure 5b over the front margin so as to obtain a front view of the cardinal process and crural plates.

The specimens represented are all from Ordovician beds of Lorraine age at Cincinnati, Ohio, and the figures are introduced here for comparison.

PLECTORTHIS PARVA (Dalman) (p. 776).[a]

FIGURE 6. Exterior of a ventral valve, to illustrate form and surface ribs. U. S. Nat. Mus. Cat. No. 52314a.
6a–d. Side views of four specimens having the two valves united, to illustrate the variation in the convexity of young and adult shells. U. S. Nat. Mus. Cat. Nos. 52314b–e, respectively.
6e. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52314f.
6f. Interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52314g.
6g. Enlargement of the posterior portion of the interior of a dorsal valve, to show the small cardinal process, etc. U. S. Nat. Mus. Cat. No. 52314h.

The locality and horizon of the specimens represented are unknown.

[a] See *Eoorthis christianiæ*, p. 776.

PLATE XCVII.

PLATE XCVII.

Eoorthis primordialis (de Verneuil and Barrande) (p. 785).

Figure 1. Ventral view of the type specimen, having the two valves united.
1a. Dorsal view of the specimen represented by figure 1.
1b. The same, seen from the side. The area of the dorsal valve is a little too short.
1c. The same, posterior view.
1d. The same, seen from the front side. Most of our specimens are less thick.

The specimen represented is from Locality **350**, Middle Cambrian limestone near Adrados, Cantabrian Mountains, Province of Leon, Spain. The figures are copied from de Verneuil and Barrande [1860, Pl. VIII, figs. 6, 6a–d].

Nisusia (Jamesella) pellico (de Verneuil and Barrande) (p. 735).

Figure 2. Ventral view of the type specimen, showing area and deltidium.
2a. Dorsal view of the specimen represented by figure 2.
2b. Posterior view of same, showing areas of valves.

The specimen represented is from Locality **350**, Middle Cambrian limestone near Adrados, Cantabrian Mountains, Province of Leon, Spain. The figures are copied from de Verneuil and Barrande [1860, Pl. VII, figs. 7, 7a–b].

Nisusia? vaticina (de Verneuil and Barrande) (p. 730).

Figure 3. Dorsal view of the type specimen, with the two valves united, showing the area of the ventral valve.
3a and 3b. Posterior and side views of same shell.

The specimen represented is from Locality **350**, Middle Cambrian limestone near Adrados, Cantabrian Mountains, Province of Leon, Spain. The figures are copied from de Verneuil and Barrande [1860, Pl. VIII, figs. 8, 8b–c].

Eoorthis bavarica (Barrande) (p. 775).

Figure 4. A distorted ventral valve, the type specimen, from Locality **303c**, passage beds between the Upper Cambrian and Ordovician, suburbs of Hof, Bavaria. Copied from Barrande [1868a, fig. 76].

Eoorthis linnarssoni (Kayser) (p. 782).

Figure 5. Dorsal valve from Locality **C64**, Upper Cambrian limestone 2.7 miles (4.4 km.) southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52549a.
5a. Ventral and dorsal valves from Locality **332a**, Upper Cambrian at Taling, Liaotung, China. Type specimen copied from Kayser [1883, Pl. III, fig. 1].

Eoorthis kayseri (Walcott) (p. 782).

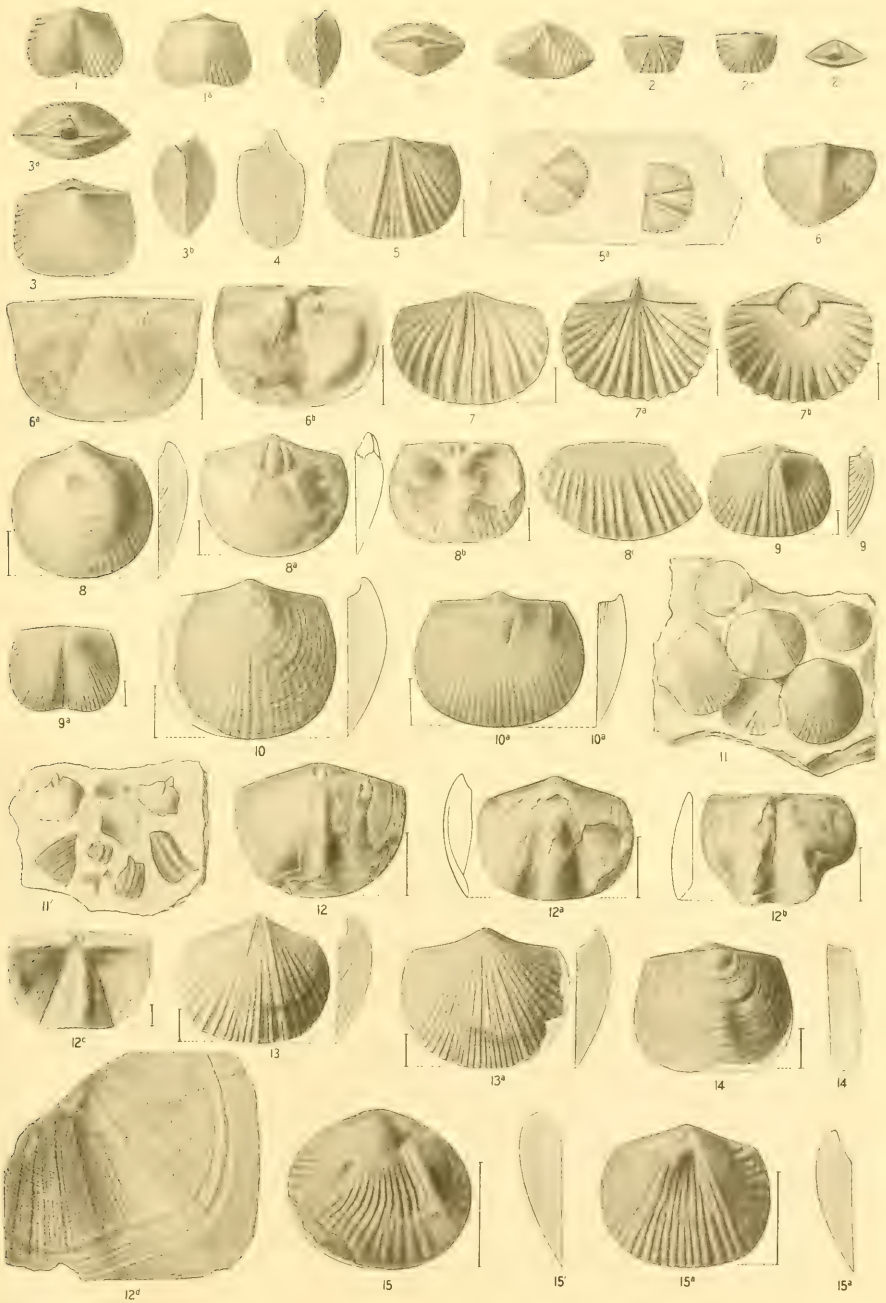
Figure 6. Partly exfoliated, distorted ventral valve. U. S. Nat. Mus. Cat. No. 52546a.
6a. Partly exfoliated dorsal valve, the type specimen. U. S. Nat. Mus. Cat. No. 52546b.
6b. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52546c.

The specimens represented are all from Locality **C64**, Upper Cambrian limestone 2.7 miles (4.4 km.) southwest of Yenchuang, Sintai district, Shantung, China.

Billingsella hicksi (Salter MS.) (Davidson) (p. 756).

Figures 7 and 7a. Ventral and dorsal views of the type specimen.
7b. Cast of ventral valve.

The specimens represented are from Localities **318d** and **318p**, Middle Cambrian sandstones in the Menevian at Porth-y-rhaw and Ninewells, near St. Davids, South Wales; Davidson does not say which. Figures 7, 7a–b are copied from Davidson [1869, Pl. XXXIII, figs. 14a, 13a, and 16a, respectively].



FRANCES WIESER DEL.

HELIOTYPE CO., BOSTON.

Billingsella pumpellyi Walcott (p. 760).

Figure 8. Top and side view of partly exfoliated ventral valve, the type specimen, from Locality **C61**, Upper Cambrian limestone 3 miles (4.8 km.) southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52558a.

8a. Top and side view of cast of a ventral valve from Locality **C36**, Upper Cambrian Chaumitien limestone at Chaumitien, Changhia district, Shantung, China. U. S. Nat. Mus. Cat. No. 52557a.

8b. Interior of dorsal valve associated with the specimen represented by figure 8a. U. S. Nat. Mus. Cat. No. 52557b.

8c. Enlargement of outer surface, near front margin, of a shell associated with the specimen represented by figure 8. U. S. Nat. Mus. Cat. No. 52558b.

Eoorthis newtonensis (Weller) (p. 784).

Figures 9 and 9a. Cast of interior of ventral and dorsal valves, with side outline of ventral valve (9′), from Locality **11c**, Upper Cambrian Hardyston quartzite, O'Donnell and McManniman's quarry, Newton, Sussex County, New Jersey. U. S. Nat. Mus. Cat. Nos. 52352a and 52352b, respectively.

Eoorthis johannensis (Matthew) (p. 781).

Figure 10. Top and side views of ventral valve, the type specimen. University of Toronto, Canada.

10a. Top and side views of dorsal valve. University of Toronto, Canada.

The specimens represented are both from Locality **308b**, Upper Cambrian limestone in shales of Division C3a of Matthew, Germaine Street, St. John, St. John County, New Brunswick. The figures are redrawn from the specimens illustrated by Matthew [1892, Pl. XII, figs. 13a–c] as *Orthisina (?) johannensis*.

Eoorthis saltensis (Kayser) (p. 788).

Figure 11. Group of shells on fragment of rock from Locality **389**, Upper Cambrian sandstone at Salta, Argentina. Type specimen, copied from Kayser [1876, Pl. I, fig. 16].

11′. Casts of two ventral valves on fragment of rock from Locality **389a**, Upper Cambrian sandstone at Nevado de Castillo, Province of Salta, Argentina. Copied from Kayser [1876, Pl. I, fig. 15].

Eoorthis pagoda (Walcott) (p. 784).

Figures 12 and 12a. Partly exfoliated ventral valves. U. S. Nat. Mus. Cat. Nos. 52552a and 52552b, respectively. Figure 12 represents the type specimen.

12b. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52552c.

12c. Interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52552d.

12d. Enlargement of a portion of the outer surface of the shell. U. S. Nat. Mus. Cat. No. 52552e.

The specimens represented are all from Locality **C56**, Upper Cambrian Chaumitien limestone at Pagoda Hill, 1 mile (1.6 km.) west of Tsinan, Shantung, China.

Eoorthis doris (Walcott) (p. 779).

Figures 13 and 13a. Top and side views of two ventral valves from Locality **C64**, Upper Cambrian limestone 2.7 miles (4.4 km.) southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. Nos. 52551a and 52551b, respectively. Figure 13a represents the type specimen.

Nisusia compta (Tate) (p. 727).

Figure 14. Top and side views of the type specimen of the species from Locality **315**, Middle? Cambrian limestone at Curramulka, Yorke Peninsula, South Australia. University of Adelaide, South Australia. Specimen figured by Tate [1892, Pl. II, figs. 6 and 6a] as *Orthisina compta*.

Eoorthis tatei (Etheridge) (p. 789).

Figures 15, 15′, and 15a, 15a′. Top and side views of ventral and dorsal valves from Locality **315b**, Middle? Cambrian limestone at Wirrialpa, Flinders Range, South Australia. University of Adelaide, South Australia. Figures 15 and 15a are redrawn from the specimens illustrated by Etheridge [1905, Pl. XXV, figs. 7 and 8, respectively]. Figure 15a represents the type specimen.

PLATE XCVIII.

PLATE XCVIII.

Orusia lenticularis (Wahlenberg) (p. 765).

[Pl. XCVIII, figs. 6, 6a–c.]

Figures 1; 1a, 1a′; and 1b. Exterior surface of ventral valves, illustrating variation in radial costæ, with side outline of specimen represented by figure 1a. Locality **390n**, Upper Cambrian limestone at Hunneberg, Province of Skaraborg, Sweden. U. S. Nat. Mus. Cat. Nos. 52400a–c, respectively.

1c and 1c′. Top and posterior views of ventral valve associated with the specimens represented by figures 1, 1a–b. Figures 1c and 2b represent forms having the characters of Matthew's "*Orusia lenticularis strophomenoides.*" U. S. Nat. Mus. Cat. No. 52400d.

1d and 1d′. Top and side views of a smooth ventral valve associated with the specimens represented by figures 1, 1a–b. U. S. Nat. Mus. Cat. No. 52400e.

1e and 1e′. Natural mold of the interior of ventral valve, with posterior outline. Locality **310a**, Upper Cambrian shales of *Olenus truncatus* zone on Oeland Island, Sweden. U. S. Nat. Mus. Cat. No. 52406a.

1f, 1f′, and 1f″. Top, side, and posterior views of a very smooth ventral valve associated with the specimen represented by figure 1e. U. S. Nat. Mus. Cat. No. 52406b.

1g and 1g′. Top and side views of a dorsal valve associated with the specimen represented by figure 1e. U. S. Nat. Mus. Cat. No. 52406c.

1h, 1i, 1j, 1k, 1l, 1m, 1n, and 1o. Series of dorsal valves and side outlines illustrating variation in form of shell and character of surface. Locality **390n**, Upper Cambrian limestone at Hunneberg, Province of Skaraborg, Sweden. U. S. Nat. Mus. Cat. Nos. 52400f–m, respectively.

1p. Cast of the interior of a small ventral valve, showing the extension of the main vascular sinuses back across the umbonal cavity; also the division of the muscle area between them by a narrow septum. This specimen is in the tray with the specimens represented by figures 1e–g, but none of the specimens received locality numbers when they were first collected and the locality may be considered doubtful. U. S. Nat. Mus. Cat. No. 52406d.

2 and 2′. Top and side views of a ventral valve from Locality **3**, Upper Cambrian limestone 300 feet above the *Paradoxides* zone on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 52402a.

2a. Ventral valve, with numerous radiating costæ, from Locality **6v**, Upper Cambrian limestones 325 feet above the Middle Cambrian on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 52404a.

2b. A small, very convex, and rugose ventral valve in which the radiating costæ are nearly obliterated, associated with the specimen represented by figure 2a. Figures 1c and 2b represent forms having the characters of Matthew's "*Orusia lenticularis strophomenoides.*" U. S. Nat. Mus. Cat. No. 52404b.

2c and 2d. Compressed ventral valves associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. Nos. 52402b and 52402c, respectively.

2c′. Side outline of specimen represented by figure 2c.

2e, 2f, 2h, 2i, and 2j. Series of dorsal valves associated with the specimen represented by figure 2, illustrating variation in form of shell and surface characters. U. S. Nat. Mus. Cat. Nos. 52402d–h, respectively.

2f′. Posterior view of specimen represented by figure 2f.

2g. Dorsal valve associated with the specimen represented by figure 2a. U. S. Nat. Mus. Cat. No. 52404c.

2k. Compressed ventral valve associated with the specimen represented by figure 2. U. S. Nat. Mus. Cat. No. 52402i.

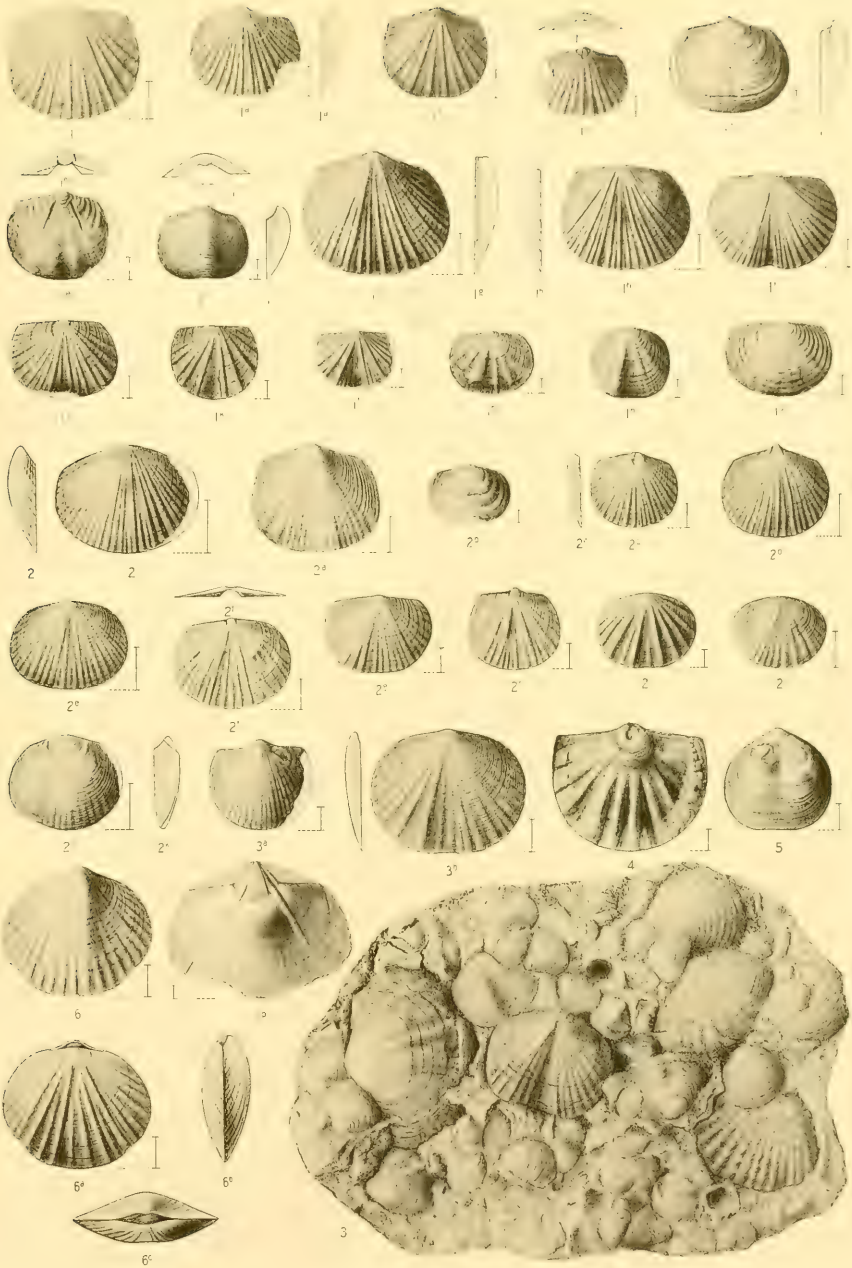
3. Enlargement of a fragment of shale on which the shells show a considerable variation.

3a and 3b. Ventral and dorsal valves.

The specimens represented by figures 3, 3a–b are in the collection of the University of Toronto, Canada, and are labeled as coming from St. John, New Brunswick. They are among the material used by Matthew in drawing figures 9a–d of his paper [1892, Pl. XII], but closer identification is impossible.

Orusia lenticularis lyncioides (Matthew) (p. 769).

Figure 4. Ventral valve from Locality **308b**, Upper Cambrian limestone in shales of Division C3a of Matthew, Germaine Street, St. John, New Brunswick. University of Toronto, Canada. Type specimen figured by Matthew [1892, Pl. XII, fig. 10a].



FRANCES WIESER DEL.

ORUSIA LENTICULARIS ATRYPOIDES (Matthew) (p. 769).

FIGURE 5. Ventral valve from Locality **308b**, Upper Cambrian limestone in shales of Division C3a of Matthew, Germaine Street, St. John, New Brunswick. University of Toronto, Canada. Type specimen figured by Matthew [1892, Pl. XII, fig. 11a].

ORUSIA LENTICULARIS (Wahlenberg) (p. 765).

[Pl. XCVIII, figs. 1, 1a–p; 2, 2a–k; and 3, 3a–b.]

FIGURES 6, 6a–c. Ventral, dorsal, side, and posterior views of a specimen from Locality **3**, Upper Cambrian limestones 300 feet above the *Paradoxides* zone on Manuels Brook, Conception Bay, Newfoundland. U. S. Nat. Mus. Cat. No. 52402j.

PLATE XCIX.

PLATE XCIX.

a. Cardinal area.
b. Dental sockets.
d. Delthyrium.
d′. Cast of diductor scars.
f. Cast of dental sockets.
pc. Pseudocruralium.
sp. Free spondylium or cast of it.
t. Teeth.

Protorthis billingsi (Hartt) (p. 739).

Figure 1. Cast of ventral valve from a natural mold, in which the area is compressed and crowded backward. U. S. Nat. Mus. Cat. No. 52424a.

1a. Natural cast of compressed ventral valve. U. S. Nat. Mus. Cat. No. 52424b.

1b, 1b′, and 1d, 1d′. Top and back views of natural casts of compressed ventral valves in which the area is shown. 1d′ shows the cast of the spondylium. U. S. Nat. Mus. Cat. Nos. 52424c and 52424d, respectively.

1c. Natural cast of a compressed ventral valve (locality unknown). University of Toronto, Canada.

1e and 1f. Natural casts of compressed dorsal valves. U. S. Nat. Mus. Cat. Nos. 52424e and 52424f, respectively.

1g. Natural cast of the outer surface of a small dorsal valve. U. S. Nat. Mus. Cat. No. 52424g.

With the exception of figure 1c the specimens represented are all from Locality **3b**, Middle Cambrian shale, head of Seeley Street, St. John, St. John County, New Brunswick. None of them has been figured before.

Protorthis quacoensis (Matthew) (p. 742).

Figure 2. Exterior of a compressed ventral valve.

2a. A minute ventral valve referred to this species.

2b. Top, side, and posterior views of the cast of an uncompressed ventral valve, showing elevation, cardinal area, and deltidium. Type specimen, figured by Matthew [1886, Pl. V, figs. 20b and 20c].

2c. An uncompressed dorsal valve, with posterior and side view in outline.

2d. Dorsal valve distorted by compression and movement in the shale.

2e. Top and posterior views of the cast of a dorsal valve. Specimen figured by Matthew [1886, Pl. V, figs. 20 and 20a].

The specimens represented are from Division 1c of Matthew's Etcheminian, but Matthew does not state [1886, pp. 44 or 82] whether they are from Porters Brook (Locality **301m**) or Portland (Locality **301g**), St. John County, New Brunswick. They are all in the collections of the University of Toronto, Canada.

Protorthis latourensis (Matthew) (p. 741).

Figures 3 and 3′. Mold of interior of a dorsal ? valve, with side outline (locality unknown). University of Toronto, Canada.

3a. Matrix in fine shale of the exterior of a ventral valve from Locality **308h**, Middle Cambrian shales of Division 1c1 at Portland, St. John, New Brunswick. U. S. Nat. Mus. Cat. No. 18185a.

3b. Posterior view of mold of a ventral valve showing mold of spondylium (locality unknown). University of Toronto, Canada.

3c. Posterior view of the mold of a ventral valve (locality unknown). University of Toronto, Canada.

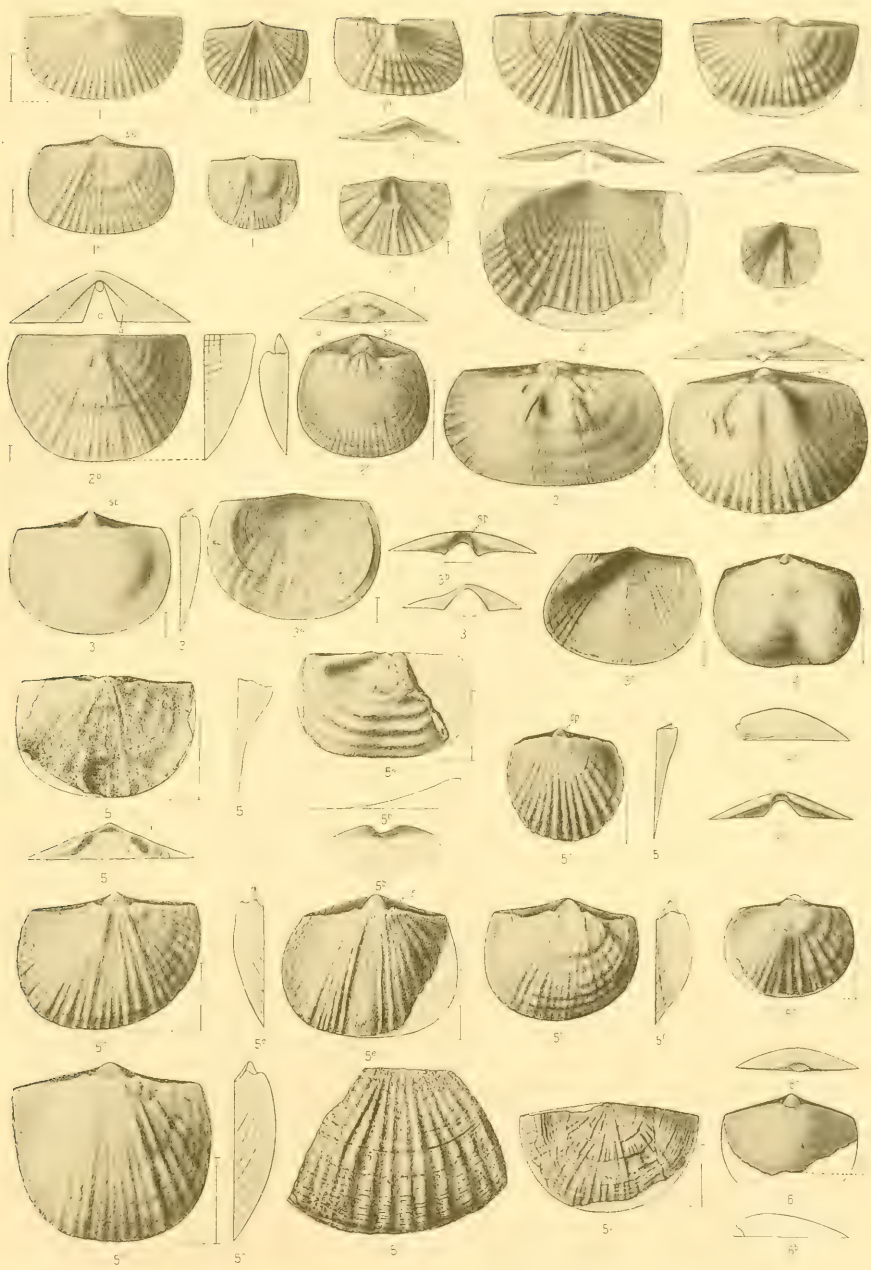
3d. Matrix of exterior of a dorsal valve from Locality **301w**, Middle Cambrian shales of Division 1c2 of Matthew at Portland, St. John, New Brunswick. U. S. Nat. Mus. Cat. No. 18168a.

Figures 3, 3b, and 3c were drawn from specimens in Matthew's original material, but none of the specimens represented by Matthew in figures 18, 18a–c [1886, Pl. V] is redrawn in this monograph.

Protorthis helena Walcott (p. 740).

Figure 4. Cast of ventral valve, the type specimen, from Locality **2u**, Middle Cambrian shale on south side of Long Island, Kennebecasis Bay, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52427a.

4a and 4b. Side and back views of the specimen represented by figure 4.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Protorthis (Loperia) dugaldensis Walcott (p. 744).

Figures 5, 5′, and 5″. Top, side, and posterior views of a mold of the interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52440a.

5a. A compressed and distorted ventral valve from Locality **2u**, Middle Cambrian, south side of Long Island, Kennebecasis Bay, St. John County, New Brunswick. U. S. Nat. Mus. Cat. No. 52446a.

5b. Side outline of the natural mold of a ventral valve. U. S. Nat. Mus. Cat. No. 52440b.

5b′. View looking from front margin toward the area and spondylium, as shown in a cast of a ventral valve. Same specimen as represented by figure 5b.

5c and 5c′. Top and side views of the natural mold of a ventral valve. The outline 5c′ shows the position of the short spondylium just beneath the beak. U. S. Nat. Mus. Cat. No. 52440c.

5d; 5e, 5e′; 5f, 5f′; 5g; and 5h, 5h′. Top and side views of natural molds of five dorsal valves. U. S. Nat. Mus. Cat. Nos. 52440d–h, respectively.

5i. Enlargement of the outer surface obtained by making a cast from the matrix of the surface. U. S. Nat. Mus. Cat. No. 52440i.

5j. Exterior of a ventral valve, drawn from impressions obtained in a natural matrix. U. S. Nat. Mus. Cat. No. 52440j.

The specimens represented by figs. 5, 5b–j (not 5a) are from Locality **10p**, Middle Cambrian sandstones of Division E2b of Matthew on Dugald Brook, Indian River, Cape Breton, Nova Scotia.

Protorthis lævis Walcott (p. 741).

Figures 6, 6a, and 6b. Top, back, and side views of the type specimen, from Locality **79a**, Upper Cambrian "St. Croix sandstone" 0.5 mile (0.8 km.) southeast of the county courthouse, Menomonie, Dunn County, Wisconsin. U. S. Nat. Mus. Cat. No. 52429a.

PLATE C.

PLATE C.

a. Cardinal area.
b. Dental sockets.
c. Crura.
cr. Pseudocruralium.
d. Deltidium.
d′. Cast of pseudocruralium.
e. Adductor scars.
r. Diductor scars.
t. Teeth.
x. Flexure line.

Nisusia festinata (Billings) (p. 727).

[Text fig. 6, p. 299.]

Figure 1. Exterior of ventral valve, drawn from mold taken in a natural cast. U. S. Nat. Mus. Cat. No. 52288a.

1a. Cast of ventral valve from Locality **25a**, Lower Cambrian limestone 2 miles (3.2 km.) east of Swanton, Franklin County, Vermont. U. S. Nat. Mus. Cat. No. 15358a. Specimen figured by Walcott [1886b, Pl. VII, fig. 7].

1b, 1b′, and 1b″. Top, side, and back views of cast of transverse ventral valve. U. S. Nat. Mus. Cat. No. 52288b.

1c and 1c′. Top and side views of cast of elevated ventral valve, with strongly marked costæ. U. S. Nat. Mus. Cat. No. 52288c.

1d and 1d′. Top and back views of cast of ventral valve, an intermediate form between those represented by figures 1b and 1c. U. S. Nat. Mus. Cat. No. 52288d.

1d″. Side view of ventral valve, with finer costæ than that represented by figure 1d. U. S. Nat. Mus. Cat. No. 52288e.

1e, 1e′, and 1e″. Top, side, and back views of a cast taken in a natural mold of a ventral valve, in which the area slopes forward. U. S. Nat. Mus. Cat. No. 52288f.

1f and 1f′. Top and side views of a cast of a dorsal valve. U. S. Nat. Mus. Cat. No. 52288g.

1g. Cast of the interior of a large dorsal valve. The reference of the markings at "e" as adductor scars is doubtful. U. S. Nat. Mus. Cat. No. 52288h.

1h and 1h′. Top and back views of a small ventral valve, from Locality **26**, Lower Cambrian sandstone east of Highgate Springs, Franklin County, Vermont. U. S. Nat. Mus. Cat. No. 15362a. Specimen figured by Walcott [1886b, Pl. VII, figs. 7a–b].

1i and 1i′. Top and side views of cast of a small transverse dorsal valve. U. S. Nat. Mus. Cat. No. 52288i.

1j. Interior of a ventral valve drawn from a cast of a natural mold. U. S. Nat. Mus. Cat. No. 52288j.

With the exception of specimens shown by figures 1a and 1h, all of the specimens represented by figures 1, 1a–j are from Locality **49**, Lower Cambrian decomposed arenaceous limestones on Codorus Creek, below Meyer's mill, near Emigsville, Pennsylvania.

Figures 2, 2′; 2a, 2a′; and 2b, 2b′. Top and side views of three ventral valves from Locality **2o**, Lower Cambrian conglomeratic limestones at Bic, Province of Quebec, Canada. U. S. Nat. Mus. Cat. Nos. 52291a, 52291b, and 52291c, respectively.

2c, 2c′, and 2c″. Top, posterior, and side views of a ventral valve, with point of the apex broken off. Associated with the specimens represented by figures 2, 2a–b. U. S. Nat. Mus. Cat. No. 52291d.

Nisusia alberta (Walcott) (p. 726).

Figure 3. Top and side view of a cast of a ventral valve. It is attached to the dorsal valve shown in figure 3a. U. S. Nat. Mus. Cat. No. 24070a. The type specimen is represented by figures 3, 3a–b.

3a. View of a cast of a dorsal valve, and the area of the ventral valve shown in figure 3. U. S. Nat. Mus. Cat. No. 24070a.

3b. Posterior view of the ventral and dorsal valves represented by figures 3 and 3a. U. S. Nat. Mus. Cat. No. 24070a.

3c. Cast of exterior surface showing ribs and stout bases of spines. U. S. Nat. Mus. Cat. No. 24070b. Copied from Walcott [1908c, Pl. I, fig. 4].

3d. Interior of the largest shell seen. Geol. Survey Canada. Copied from Walcott [1908c, Pl. I, fig. 4a].

The specimens represented are all from Locality **14s**, Middle Cambrian *Ogygopsis* zone on Mount Stephen, above Field, British Columbia.

Nisusia festinata transversa (Walcott) (p. 729).

Figures 4 and 4a. The two specimens on which the species was founded. U. S. Nat. Mus. Cat. Nos. 15361a and 15361b, respectively. Specimens figured by Walcott [1886b, Pl. VII, figs. 5 and 5a] as *Orthisina transversa*. Figure 4 represents the type specimen.

4b. Interior of a ventral valve. U. S. Nat. Mus. Cat. No. 52293a.

The specimens represented are all from Locality **25**, Lower Cambrian sandstone just above Parker's quarry, near Georgia, Franklin County, Vermont.

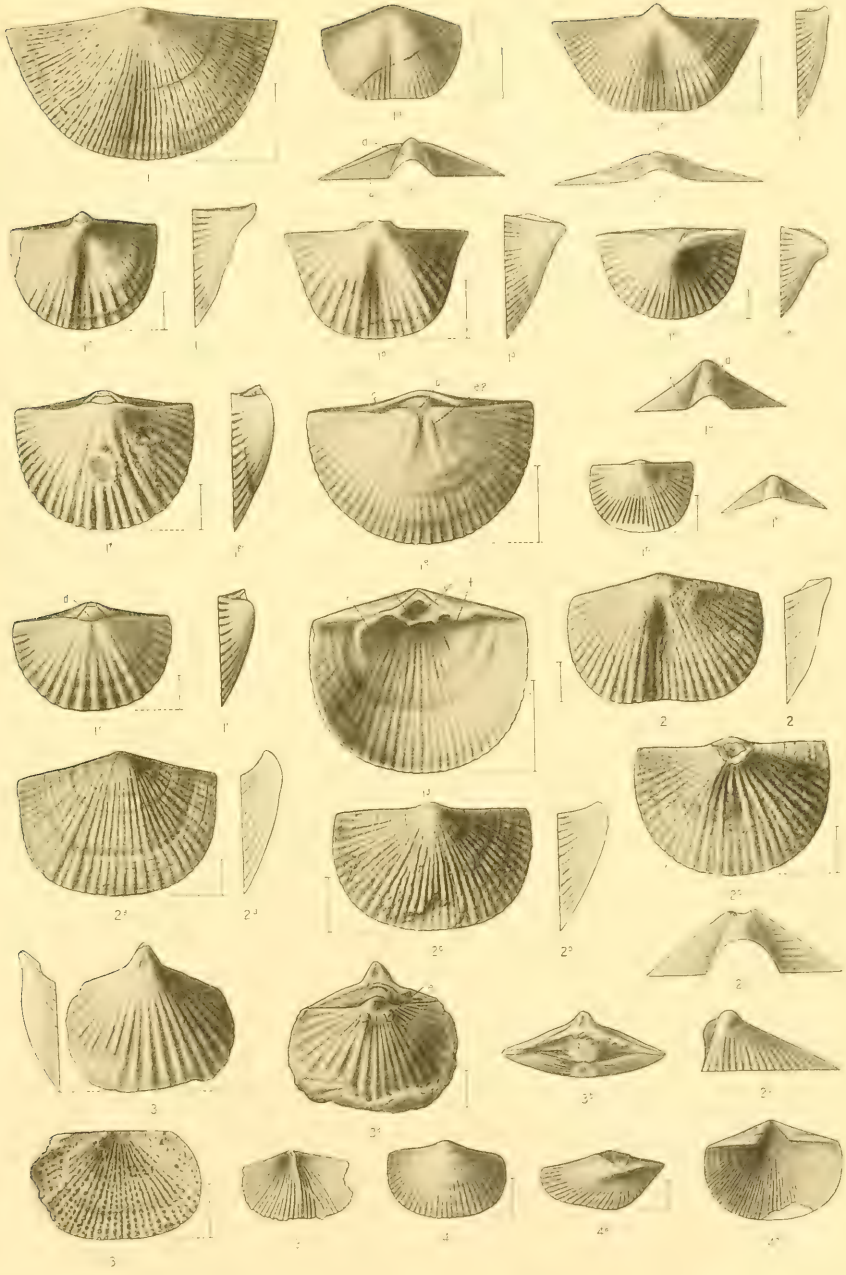


PLATE CI.

PLATE CI.

a. Cardinal area.
b. Dental sockets.
c. Crura.
d. Deltidium.
d′. Cast of umbonal cavity.
dl. Delthyrium.
e. Adductor scars.
j. Cardinal process.

Nisusia (Jamesella) perpasta (Pompeckj) (p. 735).

Figures 1 and 1a. Exterior and side views of a strongly costate ventral valve from Locality **345k**, Lower Cambrian sandstones at Slapnicky Mlýn, near Skrej, Bohemia. U. S. Nat. Mus. Cat. No. 52302a.

1b and 1c. Casts of exterior of ventral valves associated with the specimen represented by figures 1 and 1a. U. S. Nat. Mus. Cat. Nos. 52302b and 52302c, respectively.

1d, 1d′, and 1d″. Summit, back, and side views of cast of exterior of ventral valve from Locality **345i**, Lower Cambrian conglomeratic sandstones of the Kamenná hůrka, near Tejřovik, Bohemia. U. S. Nat. Mus. Cat. No. 52301a.

1e. Cast of a dorsal valve associated with the specimen represented by figures 1 and 1a. U. S. Nat. Mus. Cat. No. 52302d.

1f. Cast of a dorsal valve associated with the specimen represented by figure 1d. U. S. Nat. Mus. Cat. No. 52301b.

1g. Front view of cast of ventral valve from Locality **345i**, see figure 1d. Copied from Pompeckj [1896b, Pl. XV, fig. 16d].

1h. Cast of dorsal valve associated with the specimen represented by figures 1 and 1a. U. S. Nat. Mus. Cat. No. 52302e.

Nisusia (Jamesella) perpasta subquadrata (Pompeckj) (p. 736).

Figure 2. Cast of ventral valve from Locality **345i**, Lower Cambrian conglomeratic sandstones of the Kamenná hůrka, near Tejřovik, Bohemia. U. S. Nat. Mus. Cat. No. 52304a.

2a. Cast of ventral valve from the locality represented by figure 2. Type specimen, copied from Pompeckj [1896b, Pl. XV, fig. 19a].

2b. Cast of dorsal valve from the locality represented by figure 2. Copied from Pompeckj [1896b, Pl. XV, fig. 20a].

Nisusia (Jamesella) perpasta macra (Pompeckj) (p. 736).

Figure 3. Cast of ventral valve doubtfully referred to this variety from Locality **345i**, Lower Cambrian conglomeratic sandstones of the Kamenná hůrka, near Tejřovik, Bohemia. U. S. Nat. Mus. Cat. No. 52303a.

3a. Cast of dorsal valve from the locality represented by figure 3. Type specimen, copied from Pompeckj [1896b, Pl. XV, fig. 14].

Nisusia (Jamesella) kuthani (Pompeckj) (p. 732).

Figures 4 and 4′. Cast of exterior of ventral valve, with back view. U. S. Nat. Mus. Cat. No. 26643a.

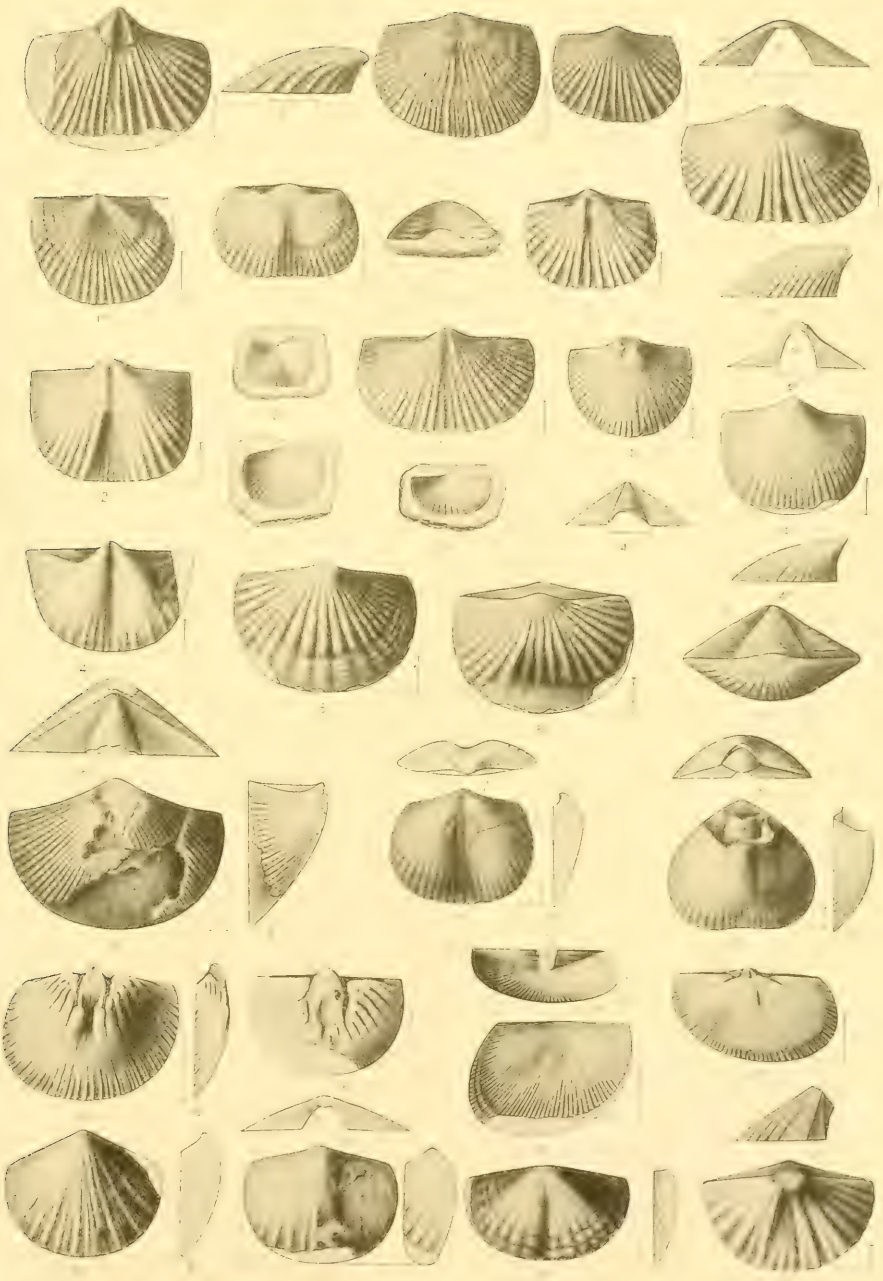
4a, 4a′, and 4a″. Summit, back, and side views of a cast of a ventral valve. U. S. Nat. Mus. Cat. No. 26643b.

4b. Cast of dorsal valve. U. S. Nat. Mus. Cat. No. 26643c.

The specimens represented are all from Locality **345i**, Lower Cambrian conglomeratic sandstones of the Kamenná hůrka, near Tejřovik, Bohemia.

Nisusia (Jamesella) erecta Walcott (p. 732).

Figures 5, 5a, and 5b. Ventral, dorsal, and back views of the type specimen, which consists of the two valves united. In figure 5a the umbo has been restored; on figure 5 the ribs are too much rounded. From Locality **313g**, Middle Cambrian limestone at the south end of the Timpahute Range in the Groom mining district, Nevada. U. S. Nat. Mus. Cat. No. 52299a.



Nisusia (Jamesella) amii Walcott (p. 731).

Figures 6, 6a, and 6b. Top, side, and back views of the type specimen, a ventral valve from Locality **56a**, Lower Cambrian limestone bowlder in Sillery conglomerate on the south shore of the St. Lawrence, 4 miles (6.4 km.) below Quebec, Canada. U. S. Nat. Mus. Cat. No. 52296.

Orusia? eurekensis (Walcott) (p. 765).

Figures 7, 7′, and 7″. Top, posterior, and side views of part of mold of the interior of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 24596a.

7a, 7a′, and 7a″. Top, posterior, and side views of a mold of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 24596b.

The specimens represented are both from Locality **55b**, Middle Cambrian, top of Eldorado limestone on west side of Secret Canyon, Eureka district, Nevada. The figures (7 and 7a) are redrawn from the specimens illustrated by Walcott [1884b, Pl. IX, figs. 8a and 8, respectively].

Billingsella dice Walcott (p. 754).

Figures 8, 8′, and 8a. Casts of the interior of two ventral valves, with side view. U. S. Nat. Mus. Cat. Nos. 52248a and 52248b, respectively. Figure 8 represents the type specimen.

8b. Partial posterior view of the matrix of a distorted ventral valve. U. S. Nat. Mus. Cat. No. 52248c.

8c. Matrix of a distorted dorsal valve. U. S. Nat. Mus. Cat. No. 52248d.

8d. Cast of the interior of a distorted dorsal valve. U. S. Nat. Mus. Cat. No. 52248e.

The specimens represented are all from Locality **319f**, Lower Ordovician drift bowlder of sandstone found near St. Albans, Vermont.

Nisusia (Jamesella) argenta Walcott (p. 731).

Figure 9. Top and side view of the type specimen, a ventral valve from Locality **1p**, limestones of No. 2 of the Silver Peak group, about 2.5 miles south of Barrel Spring, Silver Peak quadrangle, Nevada. U. S. Nat. Mus. Cat. No. 52297a.

9′. Posterior view of another ventral valve. The specimen from which this was drawn can not be located.

9a and 9a′. Top and side views of a ventral valve from Locality **1m**, limestones of No. 2 of the Silver Peak group, about 2.5 miles south of Barrel Spring, Silver Peak quadrangle, Nevada.

9b and 9b′. Top and side views of a dorsal valve. U. S. Nat. Mus. Cat. No. 52298b.

Nisusia (Jamesella) utahensis Walcott (p. 737).

Figures 10 and 10a. Top and side views of the type specimen, from Locality **7w**, Middle Cambrian limestone in Rock Canyon, in the Wasatch Mountains, east of Provo, Utah County, Utah. 52305 a

PLATE CII.

PLATE CII.

a′. Anterior adductor scars.
a″. Posterior adductor scars.
s. Median septum supporting spondylium.
sp. Cast of spondylium.
vs. Vascular sinus.

Syntrophia barabuensis (A. Winchell) (p. 799).

Figure 1. Cast of the interior of a ventral valve, showing the base of the median septum that supported the spondylium, the cast of which is clearly indicated. Locality **134a**, Upper Cambrian sandstone in quarry 1 mile (1.6 km.) southeast of the courthouse, Menomonie, Dunn County, Wisconsin.

1a. Cast of the interior of a transverse ventral valve associated with the specimen represented by figure 1, with posterior and side outline. U. S. Nat. Mus. Cat. No. 52473b.

1b. Top view and side outline of a cast of a ventral valve from Locality **83**, Upper Cambrian sandstone near Trempealeau, Trempealeau County, Wisconsin. U. S. Nat. Mus. Cat. No. 52472a. The median sinus is very faintly impressed; see figures 1c and 1d, where it is narrower and deeper.

1c and 1d. Top views and side outlines of casts of ventral valves showing variation in form and in the breadth and depth of the median sinus. From Locality **81o**, Upper Cambrian sandstone below the Cliff House, Devils Lake, Sauk County, Wisconsin. U. S. Nat. Mus. Cat. No. 52474a and 52474b, respectively.

1e and 1g. Top views and side outlines of casts of the interior of dorsal valves, illustrating variation in form, median fold, and cast of spondylium. They are associated with the specimen represented by figure 1b. U. S. Nat. Mus. Cat. Nos. 52472b and 52472c, respectively.

1f. Top view and side outline of a cast of the interior of a dorsal valve associated with the specimen represented by figure 1c. Compare the median fold and the cast of the spondylium of this specimen with those of figures 1c and 1g. U. S. Nat. Mus. Cat. No. 52474c.

Syntrophia primordialis (Whitfield) (p. 803).

Figure 2. Cast of the interior of a ventral valve, showing cast of the spondylium, the supporting median septum and large vascular sinuses. U. S. Nat. Mus. Cat. No. 52486a.

2a and 2b. Casts of the interior of ventral valves, illustrating variation in form. U. S. Nat. Mus. Cat. Nos. 52486b and 52486c, respectively.

2c and 2c′. Top and side views of cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52486d.

The specimens represented by figures 2, 2a–c are from Locality **99**, Upper Cambrian sandstone at Minneiska, Minnesota.

Figures 2d and 2e. Side and top views of the type specimen of the species, a dorsal valve from Locality **328k**, Upper Cambrian, "St. Croix sandstone" at Roche à Cris Bluff, Adams County, Wisconsin. Copied from Whitfield [1882, Pl. X, figs. 1 and 2].

Syntrophia primordialis argia Walcott (p. 804).

Figure 3. Cast of the interior of a ventral valve, the type specimen, from Locality **97**, Upper Cambrian sandstone at Reads Landing, foot of Lake Pepin, Wabasha County, Minnesota. U. S. Nat. Mus. Cat. No. 52492a.

Syntrophia nundina Walcott (p. 802).

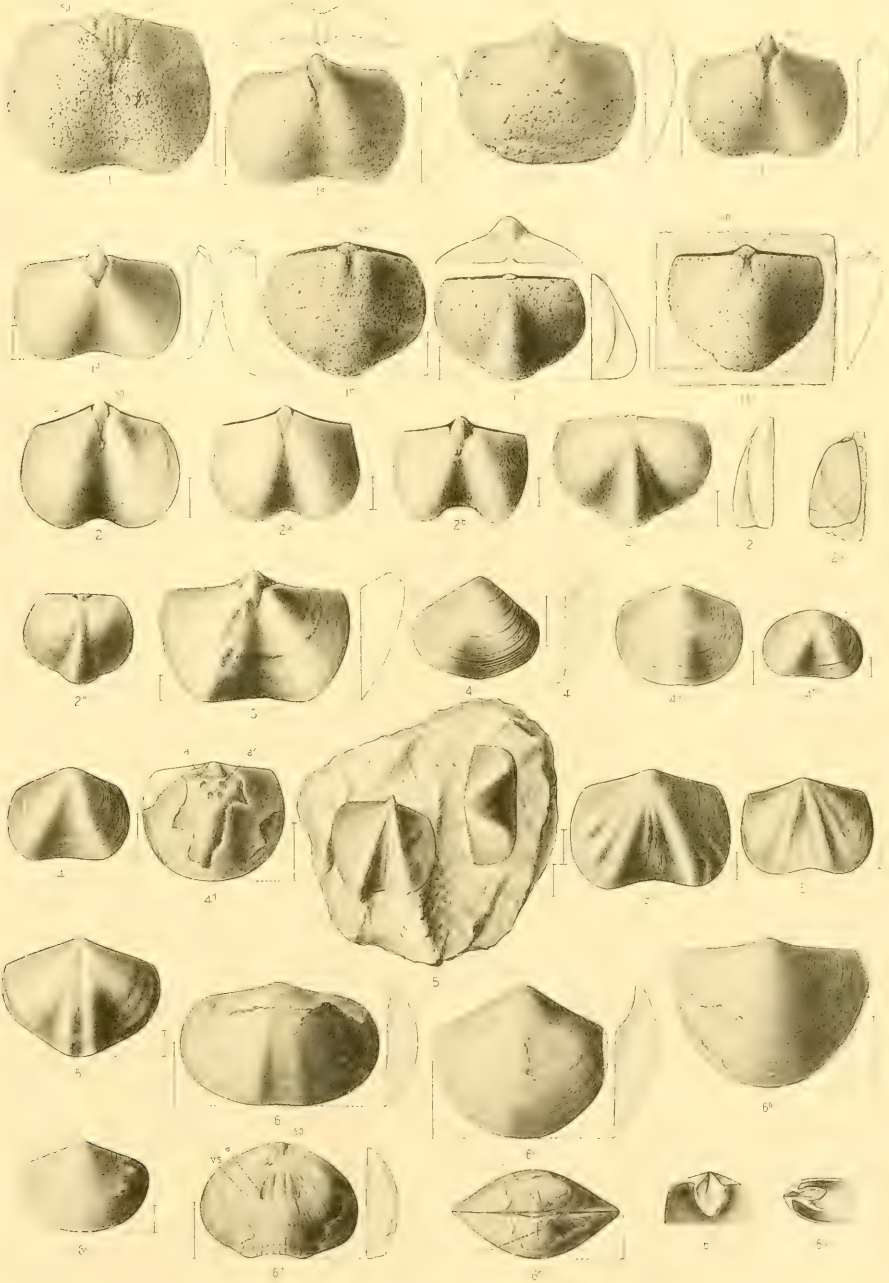
Figures 4 and 4′. Exterior and side views of a ventral valve from Locality **204**, Lower Ordovician Pogonip limestone on eastern slope of ridge east of Hamburg Ridge, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 17281a. Type specimen figured by Walcott [1884b, Pl. XI, fig. 7] as *Triplesia calcifera*.

4a. Exterior of a dorsal valve from Locality **203**, Lower Ordovician Pogonip limestone on ridge extending southwest from Wood Cone, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 17279a. Specimen figured by Walcott [1884b, Pl. XI, fig. 8] as *Triplesia calcifera*.

4b. Partly exfoliated ventral valve, in which the beak is either broken or partly worn away. Associated with the specimen represented by figure 4a. U. S. Nat. Mus. Cat. No. 17279b.

4c. Cast of the interior of a ventral valve, having an unusually deep and strongly marked median sinus. Locality **201a**, Lower Ordovician Pogonip limestone on east slope of ridge east of Hamburg Ridge, Eureka district, Nevada. U. S. Nat. Mus. Cat. No. 17280a.

4d. Partly exfoliated dorsal valve, showing the cast of the spondylium and muscle scars. U. S. Nat. Mus. Cat. No. 17491a. This specimen is doubtfully referred to this species. It is from Locality **329a**, Upper Cambrian limestone on Ute Peak, in the Wasatch Mountains, east of Cache Valley, Cache County, Utah.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

Huenella billingsi (Walcott) (p. 806).

Figure 5. Casts of two ventral valves distorted by movement of the matrix in which they were embedded. U. S. Nat. Mus. Cat. Nos. 52475a and 52475b, respectively.

5a. Exterior of a ventral valve, the type specimen, showing the character of the plications and median sinus. U. S. Nat. Mus. Cat. No. 52475c.

5b. Exterior of dorsal valve, in the same layer of limestone with specimen represented by figure 5a. U. S. Nat. Mus. Cat. No. 52475d.

5c. Exterior of dorsal valve. U. S. Nat. Mus. Cat. No. 52475e.

The specimens represented are all from Locality **28a**, Middle? Cambrian, "St. Albans formation" 1 mile (1.6 km.) east of Parker's quarry, near Georgia, Franklin County, Vermont.

Syntrophia lateralis (Whitfield) (p. 802).

[Text fig. 11, p. 299.]

Figure 6. Partly exfoliated, transverse ventral valve and side outline. U. S. Nat. Mus. Cat. No. 33447a.

6a. Partly exfoliated, subquadrate ventral valve and side outline. U. S. Nat. Mus. Cat. No. 33447b.

6b. Exterior of a transverse dorsal valve. U. S. Nat. Mus. Cat. No. 33447c.

6c. Small young dorsal valve with only a trace of the median fold. U. S. Nat. Mus. Cat. No. 33447d.

6d. Cast of interior of dorsal valve, showing sides of spondylium, adductor scars, and vascular sinuses. U. S. Nat. Mus. Cat. No. 33447e.

6e. Posterior view of the two valves. U. S. Nat. Mus. Cat. No. 33447f.

6f. Portion of the interior of the ventral valve, showing the complete spondylium and the division of its surface into median (adductor) and lateral (diductor) muscular areas. × 3. Copied from Hall and Clarke [1893b, Pl. LXII, fig. 9].

6g. Oblique view of the specimen represented in figure 6f, showing the elevation of the spondylium and the length of its supporting median septum. Copied from Hall and Clarke [1893b, Pl. LXII, fig. 10].

The specimens represented are all from Locality **227**, Ordovician limestone near Fort Cassin, Addison County, Vermont.

PLATE CIII.

PLATE CIII.

a'. Anterior adductor impressions.
a''. Posterior adductor impressions.
r. Diductor scar.
sp. Spondylium.
s. Median septum.
vs. Vascular sinus.

Huenella texana (Walcott) (p. 808).

Figure 1. Strongly costate ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52494a.

1a. Ventral valve with well-defined costæ in the mesial sinus, and nearly smooth cardinal slopes. U. S. Nat. Mus. Cat. No. 52494b.

1b. Ventral valve in which there are only slight traces of the radiating costæ in the mesial sinus. U. S. Nat. Mus. Cat. No. 52494c.

1c. Ventral valve without radiating costæ, with back outline. U. S. Nat. Mus. Cat. No. 52494d.

1d. Ventral valve, with side outline, from Locality **71**, Upper Cambrian limestone in Cold Creek Canyon, Burnet County, Texas. U. S. Nat. Mus. Cat. No. 52495a.

1e. Dorsal valve, with strong costæ on the median fold and cardinal slopes. U. S. Nat. Mus. Cat. No. 52494e.

1f. Dorsal valve, with fine radiating costæ. U. S. Nat. Mus. Cat. No. 52494f.

1g. Dorsal valve, having median fold with well-marked costæ and smooth cardinal slopes, with back outline of the same. U. S. Nat. Mus. Cat. No. 52494g.

1h. Oblique section of spondylium of ventral valve a short distance from the apex. U. S. Nat. Mus. Cat. No. 52494h.

1i. Section of dorsal valve cutting across the spondylium. U. S. Nat. Mus. Cat. No. 52494i.

With the exception of figure 1d, all the specimens represented are from Locality **68**, Upper Cambrian limestone, in Packsaddle Mountain, Llano County, Texas.

Huenella abnormis (Walcott) (p. 805).

[Text fig. 13, p. 299.]

Figure 2. Ventral valve with strong radiating costæ. U. S. Nat. Mus. Cat. No. 52462a.

2a and 2a'. Exterior and side views of ventral valve, the type specimen, with radiating costæ in the mesial sinus. U. S. Nat. Mus. Cat. No. 52462b.

2b. Cast of interior of ventral valve, showing cast of spondylium, main vascular canals, and muscle scars. U. S. Nat. Mus. Cat. No. 52462c.

2c. Dorsal valve with prominent median fold, from Locality **158**, Upper Cambrian limestone north of East Gallatin River, near Hillsdale, Threeforks quadrangle (U. S. Geol. Survey), Gallatin County, Montana. U. S. Nat. Mus. Cat. No. 52461a.

2d and 2d'. Top and side view of nearly smooth dorsal valve. U. S. Nat. Mus. Cat. No. 52462d.

2e. Dorsal valve with several plications on median fold. U. S. Nat. Mus. Cat. No. 52462e.

2f. Interior of dorsal valve showing muscle scars and vascular markings. U. S. Nat. Mus. Cat. No. 52462f.

2g. Posterior view of a ventral valve showing area. U. S. Nat. Mus. Cat. No. 52462g.

2h. Partial cast of interior of dorsal valve. U. S. Nat. Mus. Cat. No. 52462h.

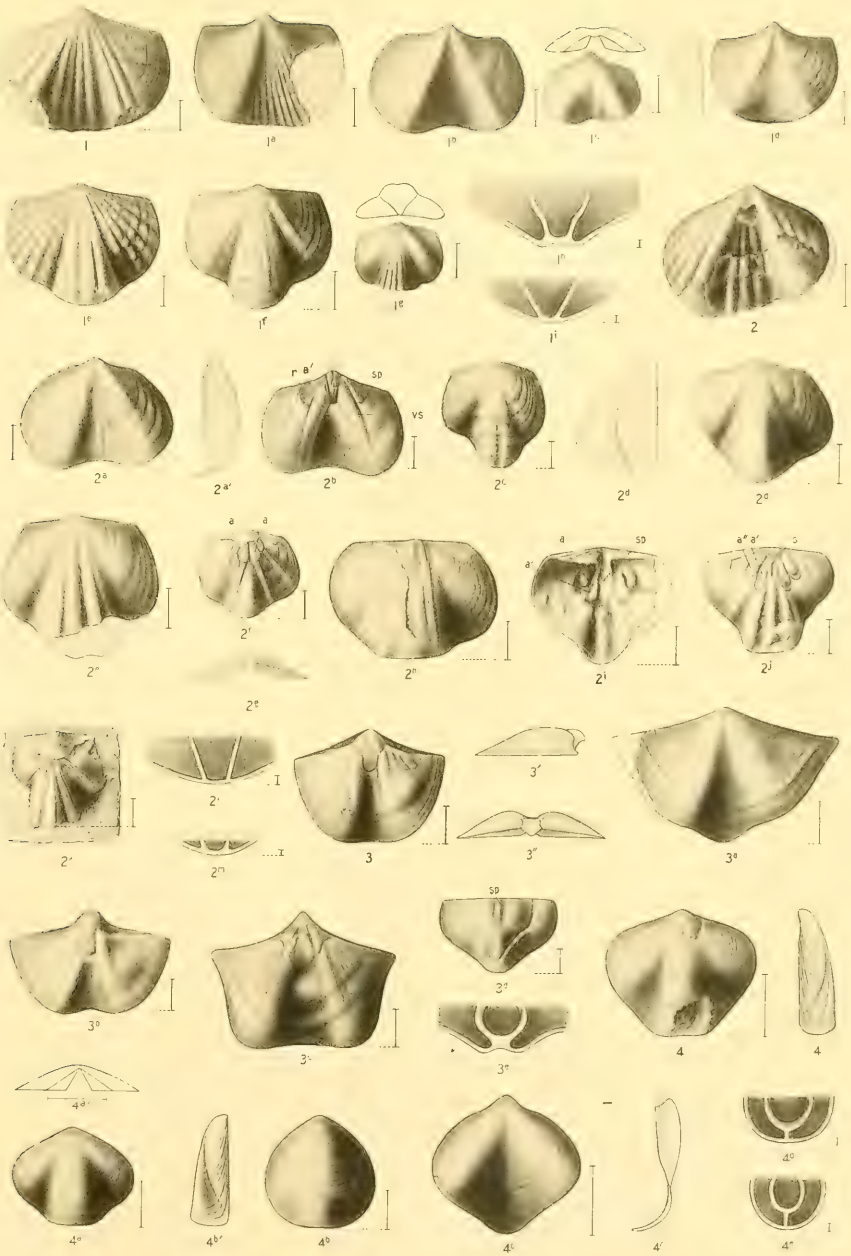
2i. Interior of a dorsal valve in which the muscle scars and spondylium (cruralium) have been more or less eroded. U. S. Nat. Mus. Cat. No. 52462i.

2j. Cast of the interior of a dorsal valve, showing strong muscle scars and radiating costæ on the mesial fold. This specimen is associated with the shell represented by figure 2c. U. S. Nat. Mus. Cat. No. 52461b.

2k. Cast of the interior of a dorsal valve, showing radiating vascular canals at the top of the cast of four strong costæ. This specimen is associated with the shell represented by figure 2c. U. S. Nat. Mus. Cat. No. 52461c.

2l and 2m. Sections of ventral and dorsal valves cut across the umbo to show sections of the spondylium in each valve. U. S. Nat. Mus. Cat. Nos. 52462j and 52462k, respectively.

With the exception of figures 2c, 2j, and 2k, the specimens represented by figures 2, 2a–m are from Locality **4j**, Middle Cambrian limestone at the head of Deep Creek, Canyon quadrangle (U. S. Geol. Survey), Yellowstone National Park, Wyoming.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

SYNTROPHIA ALATA Walcott (p. 799).

FIGURES 3, 3′, and 3″. Cast of the interior of a ventral valve, with side and back views. U. S. Nat. Mus. Cat. No. 52466a.

3a. Exterior of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52466b.

3b and 3c. Casts of interior of ventral valves. U. S. Nat. Mus. Cat. Nos. 52466c and 52466d, respectively.

3d. Partial cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 52466f.

The specimens represented by figures 3, 3a–d are all from Locality **69**, Upper Cambrian limestone near Honey Creek, Burnet County, Texas.

SYNTROPHIA ROTUNDATA Walcott (p. 804).

FIGURES 4, 4′; 4a; and 4b, 4b′. Top and side views of three dorsal valves varying in form and in strength of median fold. U. S. Nat. Mus. Cat. Nos. 52493a, 52493b, and 52493c, respectively.

4a′. View of area and hinge line of ventral valve. U. S. Nat. Mus. Cat. No. 52493h.

4c and 4c′. Top and side views of ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52493d. Another specimen (Cat. No. 52493g) was used to restore certain portions of this figure.

4d. Section across the umbo of a ventral valve, showing outline of section of spondylium. U. S. Nat. Mus. Cat. No. 52493e.

4e. Section of shell and spondylium of dorsal valve. U. S. Nat. Mus. Cat. No. 52493f.

The specimens represented by figures 4, 4a–e are all from Locality **14k**, Upper Cambrian limestone on Wolf Creek, 15 miles (24.2 km.) west-southwest of Sheridan, Bighorn Mountains, Wyoming.

PLATE CIV.

PLATE CIV.

cl. Area of attachment of posterior muscles.
h. Central scars.
sp. Cast of spondylium.
uc. Umbonal cavity.
vs. Main vascular sinuses.

Syntrophia calcifera (Billings) (p. 800).

Figure 1. Ventral valve, probably the one represented by figure 1c. Copied from Billings [1861a, fig. 3a, p. 319].
1a. Dorsal valve, possibly the one represented by figure 1e. Copied from Billings [1861a, fig. 3b, p. 319].
1b. Cast of a ventral valve showing spondylium. Copied from Billings [1861a, fig. 3c, p. 319].
1c and 1c′. Top and side views of ventral valve, from Locality **392j**, Lower Ordovician limestone at Point Levis, Province of Quebec, Canada. Geol. Survey Canada. In all probability this is the specimen used by Billings in drawing his figure 3a [1861a, p. 319]. It may be taken as the type.
1d. Ventral valve with gently rounded shallow sinus, with a large projection to fit in the fold of the dorsal valve. It is associated with the specimen represented by figure 1c. Geol. Survey Canada.
1e and 1e′. Top and side views of a dorsal valve from Locality **392i**, Lower Ordovician limestones at Phillipsburg, Province of Quebec. Geol. Survey Canada. The specimen represented by figure 1e is possibly the one used by Billings in drawing his figure 3b [1861a, p. 319].
1f. Ventral valve with side outline. U. S. Nat. Mus. Cat. No. 52476a.
1g and 1h. Top and side view of a ventral valve. U. S. Nat. Mus. Cat. No. 52476b.
1i. A smooth dorsal valve, doubtfully referred to this species. U. S. Nat. Mus. Cat. No. 52476c.

The specimens represented by figures 1f–i are from Locality **392j**, Lower Ordovician limestones at Point Levis, Province of Quebec, Canada.

Clarkella montanensis (Walcott) (p. 810).

Figures 2 and 2′. Top and back view of a broken ventral valve. U. S. Nat. Mus. Cat. No. 11587a.
2a and 2a′. Top and side view of a rhomboidal dorsal valve, the type specimen. U. S. Nat. Mus. Cat. No. 11587b.
2b. Transverse dorsal valve. U. S. Nat. Mus. Cat. No. 11587c.
2c and 2d. Sections across the umbo of two ventral valves, showing sections of the septa supporting the spondylium. U. S. Nat. Mus. Cat. Nos. 11587d and 11587e, respectively.

The specimens represented are all from Locality **302j**, Ordovician limestone east of West Gallatin (Gallatin) River, above Gallatin, Gallatin County, Montana.

Huenella orientalis (Walcott) (p. 808).

Figure 3. Top and side views of a ventral valve, the type specimen. U. S. Nat. Mus. Cat. No. 52564a.
3a. Top and side views of an exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52564b.
3b. Partly exfoliated dorsal valve. U. S. Nat. Mus. Cat. No. 52564c.

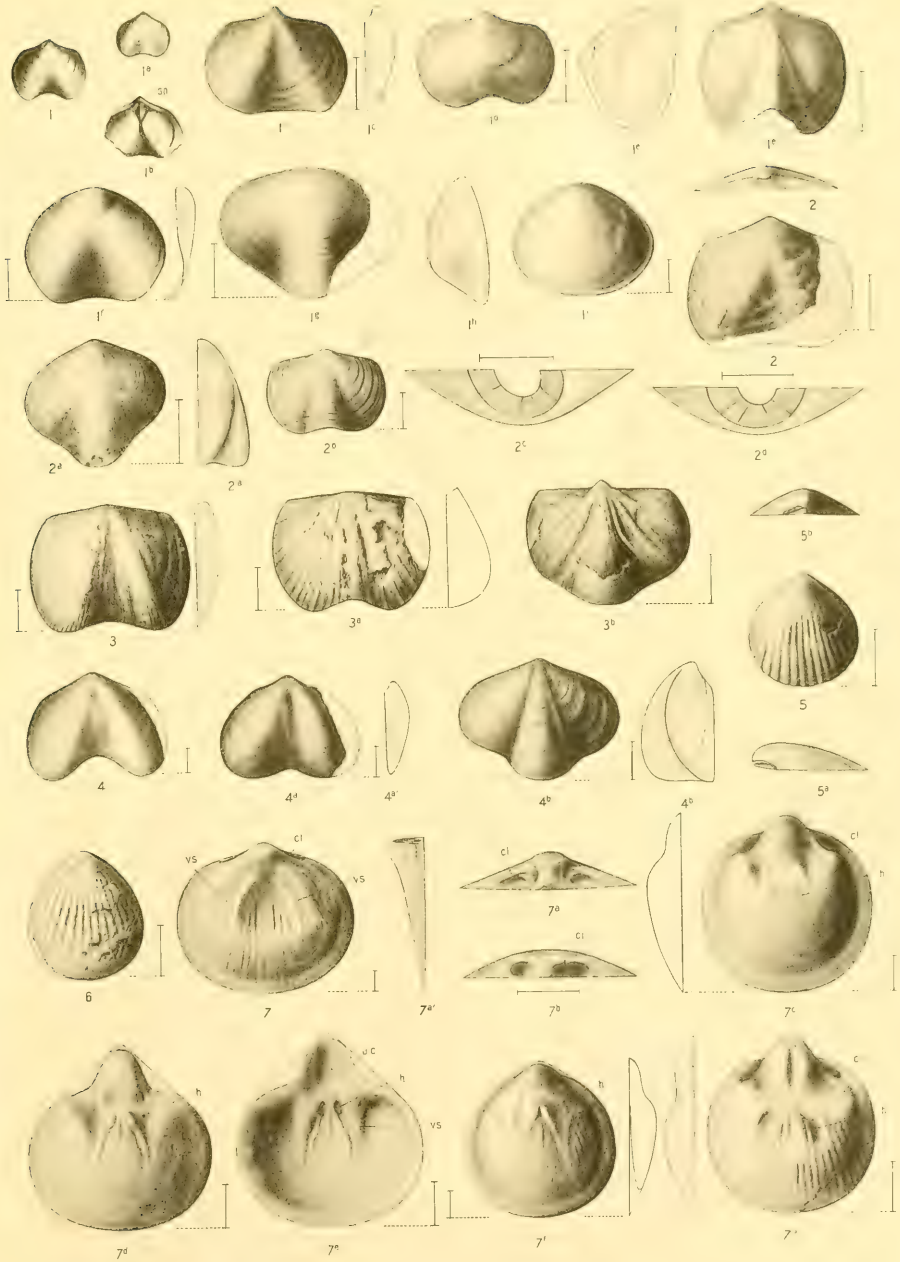
The specimens represented are all from Locality **C64**, Upper Cambrian limestone 2.7 miles (4.4 km.) southwest of Yenchuang, Sintai district, Shantung, China.

Syntrophia orthia Walcott (p. 803).

Figure 4. Ventral valve, the type specimen, from Locality **C56**, Upper Cambrian Chaumitien limestone at Pagoda Hill, 1 mile (1.6 km.) west of Tsinan, Shantung, China. U. S. Nat. Mus. Cat. No. 52562a.
4a and 4a′. Exterior of ventral valve, with side outline, from Locality **C64**, Upper Cambrian limestone 2.7 miles (4.4 km.) southwest of Yenchuang, Sintai district, Shantung, China. U. S. Nat. Mus. Cat. No. 52563a.
4b and 4b′. Top and side views of a dorsal valve from Locality **C54**, Upper Cambrian Chaumitien limestone 0.66 mile (1.1 km.) west of Tsinan, Shantung, China. U. S. Nat. Mus. Cat. No. 52561a.

Swantonia antiquata (Billings) (p. 797).

Figures 5, 5a, and 5b. Top, side, and back views of the cast of a ventral valve from Locality **319e**, Lower Cambrian sandy shales about 2 miles (3.2 km.) east of Swanton, Franklin County, Vermont. U. S. Nat. Mus. Cat. No. 15363a. This specimen was figured by Walcott [1886b, Pl. VII, fig. 8] as *Camarella antiquata*.



FRANCES WIESER DEL.

HELIOTYPE CO. BOSTON

SWANTONIA WEEKSI Walcott (p. 797).

FIGURE 6. Top view of an imperfect ventral valve, the type specimen, from Locality 1v, Lower Cambrian shales of No. 3 of the Silver Peak group, 3 miles north of Valcalda Spring and 4 miles northwest of the Drinkwater mine, Esmeralda County, Nevada. U. S. Nat. Mus. Cat. No. 52500a.

QUEBECIA CIRCE (Billings) (p. 610).

FIGURE 7. Cast of interior of ventral valve, showing outline of main vascular sinuses and cardinal muscle scars. U. S. Nat. Mus. Cat. No. 14892a.

7a and 7a′. Back and side views of specimen represented by figure 7. U. S. Nat. Mus. Cat. No. 14892a.

7b. Back view of the cast of a ventral valve, in which the cardinal scars are large and strongly defined. The specimen from which this figure was drawn can not be located.

7c. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 14892c.

7d. Artificial cast of the interior of a dorsal valve. The original specimen can not be located. U. S. Nat. Mus. Cat. No. 14892f.

7e. Artificial cast taken from the artificial cast shown by figure 7d. U. S. Nat. Mus. Cat. No. 14892e. Specimen figured by Walcott [1886b, Pl. X, fig. 3a].

7f. Cast of the interior of a dorsal valve. U. S. Nat. Mus. Cat. No. 14892b.

7g. Cast of the interior of a dorsal valve which is old and thick shelled. U. S. Nat. Mus. Cat. No. 14892d.

The specimens represented are all from Locality 3191, Lower Cambrian limestone bowlders in conglomerate at Trois Pistoles, on St. Lawrence River below Quebec, Canada.

INDEX TO PART II.

NOTE.—This index includes also reference to species figured in Part I (text figures), and all page references are to that part. In order to make the figured species easily accessible to one not familiar with the numerous changes in the generic references the entries are arranged alphabetically by genera, subgenera, species, and varieties. Roman numerals refer to plates, arabic numerals to the figures on the plates. The index to Part I includes the plate and figure reference of each of the type specimens figured in the monograph.

abnormis [Huenella], (Walcott)..... CIII: 2, 2a–m; Text fig. 13, p. 299.
acadicus [Obolus], Walcott..... XI: 5.
(Acritis) antiquissimus [Obolus], (Eichwald)..... XIII: 3; XV: 2, 2a–d.
(Acritis?) rugatus [Obolus], Walcott..... XIII: 2 and 3.
Acrothele artemis Walcott..... Text fig. 54, p. 634.
avia Matthew..... LXI: 7, 7a–b; LXII: 1, 1a–k.
avia puteis Matthew..... Not figured.
bellapunctata Walcott..... LVII: 3, 3a–b.
bellula Walcott..... LVIII: 5, 5a–h.
bergeroni Walcott..... LVIII: 6, 6a–c.
bohemica (Barrande)..... LVII: 1, 1a–d.
borgholmensis Walcott..... LXIII: 2, 2a–b.
ceratopygarum (Brögger)..... LXIII: 1, 1a–c.
colleni Walcott..... LXIII: 6, 6a–b; Text figs. 55A–E, p. 641.
coriacea Linnarsson..... LVI: 1, 1a–i.
decipiens Walcott..... LVIII: 3, 3a–d.
dichotoma Walcott..... LX: 2.
gamagei (Hobbs)..... LX: 5, 5a–c.
intermedia Linnarsson..... LVI: 3, 3a–d.
levisensis Walcott..... LXXXI: 12, 12a–b.
maculata (Salter)..... LVII: 2, 2a–b; LVIII: 2.
matthewi (Hartt)..... LXI: 1, 1a–g.
matthewi eryx Walcott..... LXI: 2.
matthewi lata Matthew..... LXI: 3.
matthewi multicostata Matthew..... LXI: 5, 5a–c.
? minuta Walcott..... LXIII: 3.
nitida (Ford)..... LVIII: 4, 4a.
panderi Walcott..... LIX: 5, 5a–c.
pretiosa (Billings)..... LVIII: 1, 1a–g.
prima (Matthew)..... LXI: 6, 6a–b; LXII: 2.
prima costata (Matthew)..... LXI: 4, 4a–d.
primæva (de Verneuil and Barrande)..... LVII: 6.
proles Matthew..... LXII: 3, 3a–e; 4, 4a.
quadrilineata Pompeckj..... LVII: 5.
rara Walcott..... LXIII: 4, 4a.
spurri Walcott..... LX: 3, 3a–c.
subsidua (White)..... LX: 1, 1a–o; 8.
subsidua hera Walcott..... LX: 9.
subsidua lævis Walcott..... Not figured.
turneri Walcott..... LX: 7, 7a.
villaboimensis Delgado..... Not figured.
woodworthi Walcott..... LX: 6.
yorkensis Walcott..... LIX: 4, 4a–b.
sp. undt. Moberg..... Not figured.
sp. undt. Walcott..... LXIII: 5.
Acrothele (Redlichella) granulata (Linnarsson)..... LVI: 2, 2a–n.
Acrothyra minor Walcott..... LXXVI: 4, 4a–b; Text fig. 59, p. 717.
proavia (Matthew)..... LXXV: 3; LXXVI: 3, 3a–u.
sera (Matthew)..... LXXX: 4, 4a–c; 5, 5a–d; 6, 6a–i; 7, 7a–b; 8?.
signata Matthew..... LXXX: 1, 1a–d.
signata orta Matthew..... LXXX: 3, 3a–b.
signata prima Matthew..... LXXX: 2, 2a–b.
Acrotreta argenta Walcott..... LXVII: 5, 5a–g.
attenuata Meek..... LXIV: 1, 1a–o; LXXIX: 6, 6a.
attenuata var. Walcott..... LXV: 2.
babel Barrande..... LXXVII: 6, 6a–b.
baileyi Matthew..... LXXVII: 2, 2a–d.
bellatula Walcott..... LXXVIII: 4, 4a–d.
belti (Davidson)..... LXXVII: 8, 8a.
bisecta Matthew..... LXVI: 7, 7a–e.
?? cancellata Walcott..... LXXIX: 5, 5a.
carinata (Segerberg MS.) Moberg and Segerberg..... Text figs. 56A–D, p. 680.
circularis Moberg and Segerberg..... Text figs. 57A–C, p. 680.
claytoni Walcott..... LXXIV: 3, 3a–b.
concentrica Walcott..... LXXVII: 1, 1a–b.
conula Walcott..... LXXV: 2, 2a–b.
convexa Walcott..... LXVI: 6, 6a–c.
curvata Walcott..... LXVIII: 1, 1a–n.
definita Walcott..... LXIV: 2, 2a–g, 3, 3a–b.
depressa (Walcott)..... LXVI: 8, 8a–c.
eggegrundensis Wiman..... LXX: 2a–d.
emmonsi Walcott..... LXV: 6.
gemma Billings..... LXVI: 1, 1a–b.
gemmula Matthew..... LXVI: 3, 3a–c; LXXVII: 5, 5a–f.
gracia Walcott..... LXVI: 5, 5a–d.
idahoensis Walcott..... LXV: 1, 1a–i; LXVIII: 2, 2a–g.
cf. idahoensis Walcott..... Not figured.
idahoensis alta Walcott..... LXV: 4, 4a–b.
idahoensis sulcata Walcott..... LXV: 5.
inchoans (Barrande)..... XV: 7, 7a.
inflata (Matthew)..... LXXVI: 1, 1a–k; 2, 2a.
kutorgai Walcott..... LXV: 3, 3a–e, g–k; Text fig. 58, p. 692.
lisani Walcott..... LXVIII: 3, 3a–c.
marjumensis Walcott..... LXVIII: 2, 2a–d.
microscopica (Shumard)..... LXVII: 1, 1a–h, 1o; 2, 2a–d.
microscopica missouriensis Walcott..... LXVII: 4, 4a–b.
microscopica tetonensis Walcott..... LXVII: 3, 3a–d.
? minima (Barrande)..... LXXVII: 7, 7a.
misera (Billings)..... LXXII: 2, 2a–l.
neboensis Walcott..... LXXVII: 9, 9a–b.
nicholsoni Davidson..... LXXIII: 1, 1a–k; 6, 6a–b.
nox Walcott..... LXXVII: 10.
oelandica Westergård..... Not figured.
ophirensis Walcott..... LXXIV: 1, 1a–p.
ophirensis descendens Walcott..... LXXVIII: 1, 1a–c.
ophirensis rugosa Walcott..... LXXIV: 2, 2a–e.
ovalis Walcott..... LXVI: 2, 2a–b.
pacifica Walcott..... LXIX: 6, 6a–e.
parvula (Wallerius)..... LXXVII: 4, 4a.
primæva Walcott..... LXIX: 1, 1a–f.
pyxidicula White..... LXIX: 2, 2a–f; 3, 3a–f.
rudis Walcott..... LXV: 3f; LXXV: 1.

Acrotreta sabrinæ (Callaway) ..... LXXIII: 5, 5a–d.
sagittalis (Salter) ..... LXXI: 2, 2a–h; 3, 3a–j.
cf. sagittalis ..... Not figured.
sagittalis magna (Matthew) ..... LXVI: 4, 4a–f.
sagittalis taconica (Walcott) ..... LXXI: 1, 1a–o.
sagittalis transversa (Hartt) ..... LXXII: 1, 1a–k.
schmalenseei Walcott ..... LXX: 1, 1a–s.
seebachi Walcott ..... LXXVII: 3, 3a.
shantungensis Walcott ..... LXIX: 5, 5a–e.
signalis Walcott ..... LXIX: 4.
socialis von Seebach ..... LXXIII: 3, 3a–c; 4, 4a–e.
spinosa Walcott ..... LXXIX: 4, 4a–g.
subconica Kutorga ..... LXXIII: 2, 2a–i.
ulrichi Walcott ..... LXXVIII: 3.
uplandica Wiman ..... LXX: 3, 3a–c.
uplandica limöensis (Wiman) ..... LXX: 4, 4a–c.
sp. undt. Walcott ..... Not figured.
sp. undt. Westergård ..... Not figured.
acuminata [Linguiella (Lingulepis)], (Conrad) ..... XXXIV: 3, 3a–e; XL: 1, 1a–s; XLI: 1, 1a–n; XLII: 1, 1a–o.
acuminata meeki [Lingulella (Lingulepis)], (Walcott) ..... XLI: 2, 2a.
acuminata sequens [Lingulella (Lingulepis)], Walcott ..... Text figs. 46A–B, p. 551.
acuminatus [Obolus (Schmidtia)], Mickwitz ..... XIV: 2, 2a–c.
acutangula [Lingulella], (Roemer) ..... XVII: 1, 1a–o.
advenus [Obolus?], Barrande ..... XII: 5, 5a–b.
affinis [Obolus (Lingulobolus)], (Billings) ..... XVI: 1, 1a–e.
agnostorum [Lingulella], (Wallerius) ..... XXX: 15.
agreste [Eoorthis], (Walcott) ..... LXXXIX: 6, 6a.
alabamaensis [Micromitra], (Walcott) ..... II: 5, 5a–c.
Ålandensis [Obolus (Westonia)], Walcott ..... XLVIII: 6, 6a.
alata [Syntrophia], Walcott ..... CIII: 3, 3a–d.
alberta [Nisusia], (Walcott) ..... C: 3, 3a–d.
alta [Acrotreta idahoensis], Walcott ..... LXV: 4, 4a–b.
ambigua [Elkania], (Walcott) ..... LI: 2, 2a–c.
amii [Nisusia (Jamesella)], Walcott ..... CI: 6, 6a–b.
ampla [Lingulella], (Owen) ..... XXVIII: 1, 1a–j.
anatina [Lingula], Bruguière ..... Text figs. 34C–D, p. 374.
anceps [Obolus], Walcott ..... X: 3, 3a–f.
ancillus [Obolus?], (Barrande) ..... XII: 2.
anomala [Wimanella?], (Walcott) ..... LXXXVII: 1, 1a–e.
antiquata [Swantonia], (Billings) ..... CIV: 5, 5a–b.
antiquissimus [Obolus (Acritis)], (Eichwald) ..... XIII: 3; XV: 2, 2a–d.
apollinis [Obolus], Eichwald ..... VII: 1–8, 10–17; XIV: 6, 6a; Text figs. 4 and 15, p. 299.
apollinis ingricus [Obolus], Eichwald ..... Not figured.
apollinis maximus [Obolus], Mickwitz ..... VII: 9; XIV: 7, 7a.
apollinis quenstedti [Obolus], (Mickwitz) ..... Text figs. 34A–B, p. 374.
appalachia [Billingsella?], Walcott ..... LXXXVII: 2, 2a–b.
appalachia [Dicellomus], Walcott ..... LIII: 4, 4a–g.
argenta [Acrotreta], Walcott ..... LXVII: 5, 5a–g.
argenta [Nisusia (Jamesella)], Walcott ..... CI: 9, 9a–b.
argia [Syntrophia primordialis], Walcott ..... CII: 3.
arguta [Lingulella], (Walcott) ..... XXIV: 5, 5a–b.
artemis [Acrothele], Walcott ..... Text fig. 54, p. 634.
asiatica [Obolella], Walcott ..... LV: 6, 6a.
atava [Lingulella], (Matthew) ..... XXXV: 5, 5a–h.
atava [Eoorthis], (Matthew) ..... XCV: 7, 7a–b.
atava insulæ [Lingulella], (Matthew) ..... XXXV: 8, 8a.
atlantica [Obolella], Walcott ..... LV: 1a–i; Text fig. 51, p. 590.
atrypoides [Orusia lenticularis], (Matthew) ..... XCVIII: 5.
attenuata [Acrotreta], Meek ..... LXIV: 1, 1a–o; LXXIX: 6, 6a.
attenuata var. [Acrotreta], Walcott ..... LXV: 2.
auga [Lingulella], (Walcott) ..... XXIV: 6, 6a–g.
aurora [Obolus (Westonia)], (Hall) ..... XLVI: 1, 1a–h.
avia [Acrothele], Matthew ..... LXI: 7, 7a–b; LXII: 1, 1a–k.
avia puteis [Acrothele], Matthew ..... Not figured.
babel [Acrotreta], Barrande ..... LXXVII: 6, 6a–b.
baileyi [Acrotreta], Matthew ..... LXXVII: 2, 2a–d.
balticus [Obolus (Westonia)], Walcott ..... XLVIII: 7, 7a–b.
barabuensis [Syntrophia], (A. Winchell) ..... CII: 1, 1a–g.
? barrandei [Botsfordia], Walcott ..... LVII: 7, 7a–b.
bavarica [Eoorthis], (Barrande) ..... XCVII: 4.
bavaricus [Obolus?], (Barrande) ..... XV: 10, 10a.
bella [Lingulella], (Walcott) ..... XIX: 2, 2a–q; XXXVI: 4.
bella [Micromitra (Paterina)], (Billings) ..... II: 1, 1a–c.
bellapunctata [Acrothele], Walcott ..... LVII: 3, 3a–b.
bellatula [Acrotreta], Walcott ..... LXXVIII: 4, 4a–d.
belli [Obolus], (Billings) ..... XXXVIII: 3, 3a–b.
bellula [Acrothele], Walcott ..... LVIII: 5, 5a–h.
bellula [Lingulella], (Walcott) ..... XIX: 1, 1a–e.
bellulus [Obolus (Fordinia)], (Walcott) ..... LI: 3, 3a–f.
belti [Acrotreta], (Davidson) ..... LXXVII: 8, 8a.
bergeroni [Acrothele], Walcott ..... LVIII: 6, 6a–c.
Bicia gemma (Billings) ..... L: 1, 1a–n.
whiteavesi Walcott ..... L: 2, 2a–e.
Billingsella? appalachia Walcott ..... LXXXVII: 2, 2a–b.
bivia Walcott ..... Text figs. 65A–C, p. 750.
coloradoensis (Shumard) ..... LXXXV: 1, 1a–z; Text figs. 5, p. 299, and 66, p. 751.
dice Walcott ..... CI: 8, 8a–d.
exporrecta (Linnarsson) ..... LXXXVIII: 1, 1a–l.
exporrecta rugosicostata Walcott ..... LXXXVIII: 2, 2a–c.
hicksi (Salter MS.) (Davidson) ..... XCVII: 7, 7a–b.
highlandensis (Walcott) ..... LXXXVII: 4, 4a–c.
lindströmi (Linnarsson) ..... LXXXVII: 6, 6a–f.
major Walcott ..... LXXXVI; 1, 1a.
marion Walcott ..... Text figs. 67A–B, p. 753.
obscura Walcott ..... LXXXVI: 6.
orientalis (Whitfield) ..... LXXXVI: 2, 2a–b.
plicatella Walcott ..... LXXXVI: 3, 3a–n; Text fig. 1, p. 299.
pumpelliyi Walcott ..... XCVII: 8, 8a–c.
retroflexa (Matthew) ..... XC: 1, 1a–h.
richthofeni Walcott ..... LXXXIX: 1.
romingeri (Barrande) ..... XC: 2, 2a–n.
salemensis (Walcott) ..... LXXXVII: 3, 3a.
striata Walcott ..... LXXXVI: 4, 4a–c.
whitfieldi (Walcott) ..... LXXXVI: 5, 5a.
billingsi [Huenella], (Walcott) ..... CII: 5, 5a–c.
billingsi [Protorthis], (Hartt) ..... XCIX: 1, 1a–g.
billingsiana [Lingulella], (Whiteaves) ..... XXIX: 3, 3a.
bisecta [Acrotreta], Matthew ..... XLVI: 7, 7a–e.
bivia [Billingsella], Walcott ..... Text figs. 65A–C, p. 750.
blackwelderi [Obolus (Westonia)] Walcott ..... XXXIX: 10, 10a–c.
bohemica [Acrothele], (Barrande) ..... LVII: 1, 1a–d.
borgholmensis [Acrothele], Walcott ..... LXIII: 2, 2a–b.
bornemanni [Lingulella], (Walcott) ..... XXX: 18, 18a–c.
Botsfordia? barrandei Walcott ..... LVII: 7, 7a–b.
cælata (Hall) ..... LIX: 1, 1a–q; 3, 3a–b.
granulata (Redlich) ..... LVII: 4, 4a–r.
pulchra (Matthew) ..... LXII: 5, 5a–l.
bottnicus [Obolus (Westonia)], (Wiman) ..... XLVIII: 4, 4a–c.
bretonensis [Obolus (Palæobolus)], (Matthew) ..... XXXII: 5, 5a–g.
bretonensis lens [Obolus (Palæobolus)], (Matthew). Not figured.
(Bröggeria) salteri [Obolus], (Holl) ..... XIII: 1, 1a–n; XV: 4, 4a–d.
buchi [Keyserlingia], (de Verneuil) ..... LXXXI: 4, 4a–e.
buttsi [Lingulella], Walcott ..... XXIX: 4, 4a–b.
cælata [Botsfordia], (Hall) ..... LIX: 1, 1a–q; 3, 3a–b.
calcifera [Syntrophia], (Billings) ..... CIV: 1, 1a–i.
cambria [Schuchertina], Walcott ..... LI: 6, 6a–m.
cambria [Syntrophia], Walcott ..... Text figs. 72A–D, p. 800.
campbelli [Syntrophia], Walcott ..... Text figs. 73A–F, p. 801.
cancellata [Acrotreta??], Walcott ..... LXXIX: 5, 5a.
cania [Lingulella], (Walcott) ..... XXXV: 3, 3a–d.

carinata [Acrotreta], (Segerberg MS.) Moberg and Segerberg.....Text figs. 56A–D, p. 680.
cedens [Lingulella], (Barrande).....XXX: 8.
celatus [Obolus (Schmidtia)], (Volborth).....XIV: 1, 1a–c.
ceratopygarum [Acrothele], (Brögger).....LXIII: 1, 1a–c.
chinensis [Obolus], (Walcott).....XXXIX: 7, 7a–b.
christianiæ [Eoorthis], (Kjerulf).....XCV: 1, 1a–h.
chromatica [Obolella], Billings.....LIV: 1, 1a–i.
chuarensis [Obolus (Westonia)], (Walcott).....XXV: 2, 2a–e.
cingulata [Kutorgina], (Billings).....V: 1, 1a–s; Text figs. 3 and 8, p. 299, and 50A–C, p. 581.
circe [Quebecia], (Billings).....CIV: 7, 7a–g.
circularis [Acrotreta], Moberg and Segerberg.....Text figs. 57A–C, p. 680.
clarkei [Lingulella], Walcott.....Text figs. 42A–D, p. 486.
Clarkella montanensis (Walcott).....CIV: 2, 2a–d.
clarki [Dearbornia], Walcott.....LXXXII: 7, 7a–d.
claytoni [Acrotreta], Walcott.....LXXIV: 3, 3a–b.
colleni [Acrothele], Walcott.....LXIII: 6, 6a–b; Text figs. 55A–E, p. 641.
collicia [Lingulella], (Matthew).....XXXV: 1, 1a–f; 2, 2a–d.
coloradoensis [Billingsella], (Shumard).....LXXXV: 1, 1a–z; Text figs. 5, p. 299, and 66, p. 751.
columbiana [Philhedra], (Walcott).....LXXXI: 10.
complexus [Obolus], Barrande.....XII: 3, 3a; 8, 8a.
compta [Nisusia], (Tate).....XCVII: 14.
concentrica [Acrotreta], Walcott.....LXXVII: 1, 1a–b.
concinna [Lingulella], Matthew.....XXXIII: 2, 2a–h; XXXIV: 1, 1a–r.
contraria [Orbiculoidea], (Barrande).....LXXXI: 9.
conula [Acrotreta], Walcott.....LXXV: 2, 2a–b.
convexa [Acrotreta], Walcott.....LXVI: 6, 6a–c.
convexa [Lingulella winona], (Walcott).....XVIII: 4, 4a–d.
coriacea [Acrothele], Linnarsson.....LVI: 1, 1a–i.
corrugata [Finkelnburgia osceola], (Walcott).....Not figured.
costata [Acrothele prima], (Matthew).....LXI: 4, 4a–d.
crassa [Obolella], (Hall).....LIV: 2, 2a–n; Text fig. 14, p. 299.
crassa elongata [Obolella], Walcott.....LV: 5, 5a.
crassus [Obolus (Schmidtia)], Mickwitz.....XIV: 4, 4a–d.
crenistria [Micromitra (Paterina)], (Walcott).....III: 4, 4a–b.
cuneola [Linguiella], (Whitfield).....XXVII: 7, 7a–b.
Curticia elegantula Walcott.....I: 2, 2a–l.
curvata [Acrotreta], Walcott.....LXVIII: 1, 1a–n.
cyane [Obolus], (Billings).....XXVII: 4, 4a–b.
Dalmanella multisecta (Meek).....Text fig. 9, p. 299.
parva (de Verneuil).....Text fig. 10, p. 299.
subequata (Conrad).....Text fig. 2, p. 299.
damesi [Lingulella], (Walcott).....XXXIX: 8, 8a–c.
dartoni [Obolus (Westonia)], Walcott.....Text figs. 40A–C, p. 455.
daunus [Eoorthis], (Walcott).....XCV: 2, 2a–c.
davidsoni [Lingulella], (Barrande).....XXXII: 1, 1a–e.
davisi [Lingulella], (McCoy).....XXX: 2, 2a; XXXI: 6, 6a–h.
Dearbornia clarki Walcott.....LXXXII: 7, 7a–d.
decipiens [Acrothele], Walcott.....LVIII: 3, 3a–d.
decipiens [Obolus mcconnelli], Walcott.....XXIII: 4, 4a–b.
definita [Acrotreta], Walcott.....LXIV: 2, 2a–g; 3, 3a–b.
Delgadella lusitanica (Delgado).....XXIX: 5, 5a–b.
delgadoi [Lingulella], Walcott.....XXIX: 6, 6a–c.
depressa [Acrotreta], (Walcott).....XLVI: 8, 8a–c.
descendens [Acrotreta ophirensis], Walcott.....LXXVIII: 1, 1a–c.
desiderata [Elkania], (Billings).....LI: 1, 1a–d.
desiderata [Lingulella], (Walcott).....XX: 4, 4a–c; 5, 5a–j.
desmopleura [Eoorthis], (Meek).....XCVI: 1, 1a–r.
desmopleura nympha [Eoorthis], Walcott.....XCVI: 2.
diablo [Eoorthis?], (Walcott).....XCIII: 3.
dice [Billingsella], Walcott.....CI: 8, 8a–d.
Dicellomus appalachia Walcott.....LIII: 4, 4a–g.
Dicellomus nanus (Meek and Hayden).....LIII: 1, 1a–l; 2, 2a, 3, 3a–d.
parvus Walcott.....LXXXIX: 11, 11a–d.
pectenoides (Whitfield).....LII: 6, 6a–c; Text figs. 48A–B, p. 575.
politus (Hall).....LII: 1, 1a–k; 2, 2a–i; 3; 4, 4a; 5, 5a–b; Text figs. 16A–B, p. 314, and 49A–B, p. 576.
prolificus Walcott.....LXXXIX: 10, 10a–b.
sp. undt. Walcott.....LII: 7, 7a.
dichotoma [Acrothele], Walcott.....LX: 2.
Discinolepis granulata Waagen.....LXXXI: 3, 3a–b.
Discinopsis gulielmi (Matthew).....LXXXII: 5, 5a–c.
? sulcatus Walcott.....LXXXII: 6.
discoideus [Obolus], (Hall and Whitfield).....XVIII: 6, 6a–d.
dolatus [Obolus], (Sardeson).....Text figs. 35A–B, p. 390.
doris [Eoorthis], (Walcott).....XCVII: 13, 13a.
dubia [Lingulella], (Walcott).....XXIV: 4, 4a.
dubia [Siphonotreta], Walcott.....LXXXI: 7, 7a–b.
dugaldensis [Protorthis (Loperia)], Walcott.....XCIX: 5, 5a–j.
edsoni [Rustella], Walcott.....I: 1, 1a–e.
eggegrundensis [Acrotreta], Wiman.....LXX: 2a–d.
eichwaldi [Obolus], Mickwitz.....Not figured.
elegans [Obolus], Mickwitz.....XV: 3.
elegantula [Curticia], Walcott.....I: 2, 2a–l.
elegantula [Eostrophomena], (Walcott).....XCV: 6, 6a–b.
Elkania ambigua (Walcott).....LI: 2, 2a–c.
desiderata (Billings).....LI: 1, 1a–d.
ida (Billings).....XXX: 20, 20a; LI: 4, 4a–c.
ella [Obolus (Westonia)], (Hall and Whitfield).....XXXIII: 3, 3a–c; XLVII: 1, 1a–p.
ella onaquiensis [Obolus (Westonia)], Walcott.....XLIX: 6, 6a.
ellsi [Lingulella], (Walcott).....XIX: 3, 3a–c.
elongata [Obolella crassa], Walcott.....LV: 5, 5a.
elongatus [Obolus (Westonia)], Walcott.....LXIII; 8, 8a–d.
emmonsi [Acrotreta], Walcott.....LXV: 6.
endlichi [Micromitra sculptilis], Walcott.....Text fig. 22, p. 342.
Eoorthis agreste (Walcott).....LXXXIX: 6, 6a.
atava (Matthew).....XCV: 7, 7a–b.
bavarica (Barrande).....XCVII: 4.
christianiæ (Kjerulf).....XCV: 1, 1a–h.
daunus (Walcott).....XCV: 2, 2a–c.
desmopleura (Meek).....XCVI: 1, 1a–r.
desmopleura nympha (Walcott).....XCVI: 2.
? diablo (Walcott).....XCIII: 3.
doris (Walcott).....XCVII: 13, 13a.
hastingsensis (Walcott).....XCIV: 3, 3a–c.
iddingsi (Walcott).....XCI: 3, 3a–b.
indianola (Walcott).....XCIV: 1t, 2, 2a–h.
johannensis (Matthew).....XCVII: 10, 10a.
kayseri (Walcott).....XCVII: 6, 6a–b.
kichouensis (Walcott).....LXXXIX: 5.
linnarssoni (Kayser).....XCVII: 5, 5a.
newberryi Walcott.....Text figs. 69A–D, p. 783.
newtonensis (Weller).....XCVII: 9, 9a.
pagoda (Walcott).....XCVII: 12, 12a–d.
papias (Walcott).....XCI: 4.
primordialis (de Verneuil and Barrande).....XCVII: 1, 1a–d.
remnicha (Winchell).....XCI: 1, 1a–s; XCII: 2, 2a–d; 3, 3a–e; Text fig. 7, p. 299.
remnicha sulcata (Walcott).....XCII: 1, 1a–c.
remnicha texana (Walcott).....XCII: 4, 4a–g.
remnicha winfieldensis (Walcott).....XCI: 2, 2a–e.
saltensis (Kayser).....XCVII: 11.
tatei (Etheridge).....XCVII: 15, 15a.
thyone Walcott.....Text figs. 70A–C, p. 789.
tullbergi (Walcott).....XCV: 3.
wichitaensis (Walcott).....XCIV: 1, 1a–o, 1u.
wichitaensis læviusculus (Walcott).....XCIV: 1p–s.

Eoorthis wimani (Walcott) ..... XCV: 4, 4a–d.
zeno Walcott ..... Text figs. 71A–B, p. 792.
sp. undt. a (Pompeckj) ..... Not figured.
sp. undt. b (Pompeckj) ..... Not figured.
sp. undt. c (Walcott) ..... LXXXIX: 7.
sp. undt. d Walcott ..... LXXXIX: 8.
sp. undt. e Walcott ..... Not figured.
Eostrophomena elegantula (Walcott) ..... XCV: 6, 6a–b.
erecta [Nisusia (Jamesella)], Walcott ..... CI: 5, 5a–b.
eros [Lingulella (Lingulepis)], (Walcott) ..... XXXIX: 9, 9a.
eryx [Acrothele matthewi], Walcott ..... LXI: 2.
escasoni [Obolus (Westonia)], (Matthew) ..... XLIX: 1, 1a–f.
esthonia [Schizambon?], Walcott ..... LXXXIV: 4.
etheridgei [Huenella], Walcott ..... LXXXIX: 9, 9a.
etheridgei [Micromitra (Paterina)], (Tate) ..... III: 10, 10a–c.
euglyphus [Obolus (Westonia)], (Walcott) ..... XLVIII: 1, 1a–f.
eurekensis [Orusia?], (Walcott) ..... CI: 7, 7a.
excelsis [Trematobolus], Walcott ..... LXXXII: 8, 8a–b.
exigua [Lingulella (Lingulepis)], (Matthew) ..... XXXIII: 4, 4a; XLIII: 1, 1a–z.
eximia [Lingula?], Barrande ..... XXXII: 3.
exporrecta [Billingsella], (Linnarsson) ..... LXXXVIII: 1, 1a–l.
exporrecta rugosicostata [Billingsella], Walcott ..... LXXXVIII: 2, 2a–c.
favosa [Obolella (Glyptias)], (Linnarsson) ..... LV: 2, 2a–d.
feistmanteli [Obolus], (Barrande) ..... XII: 1, 1a–f; 9, 9a.
ferruginea [Lingulella], Salter ..... XXIX: 1, 1a–w; XXIX: 2, 2a–f; XXX: 1; XXXI: 3, 3a–c; XXXV: 4, 4a–b.
cf. ferruginea [Lingulella], Walcott ..... XXX: 4.
festinata [Nisusia], (Billings) ..... C: 1, 1a–j; 2, 2a–c; Text fig. 6, p. 299.
festinata transversa [Nisusia], (Walcott) ..... C: 4, 4a–b.
finkelnburgi [Finkelnburgia], (Walcott) ..... XCIII: 2, 2a–e.
Finkelnburgia finkelnburgi (Walcott) ..... XCIII: 2, 2a–e.
osceola (Walcott) ..... XCIII: 1, 1a–h.
osceola corrugata (Walcott) ..... Not figured.
finlandensis [Obolus (Westonia)], Walcott ..... XLVIII: 3, 3a–b.
flumenis [Lingulella], (Matthew) ..... XXXV: 6, 6a–b.
(Fordinia) bellulus [Obolus], (Walcott) ..... LI: 3, 3a–f.
gilberti [Obolus], Walcott ..... LI: 5, 5a–d.
perfectus [Obolus], Walcott ..... LXIII: 10, 10a–d.
formosa [Mickwitzia], (Wiman) ..... VI: 3, 3a–c.
fragilis [Obolus], (Walcott) ..... XXIII: 5, 5a–e.
franklinensis [Lingulella], (Walcott) ..... XXVI: 3, 3a–b.
fuchsi [Lingulella], Redlich ..... XXXIX: 2, 2a–c; 3.
garnagei [Acrothele], (Hobbs) ..... LX: 5, 5a–c.
gemma [Acrotreta], Billings ..... LXVI: 1, 1a–b.
gemma [Bicia], (Billings) ..... L: 1, 1a–n.
gemmula [Acrotreta], Matthew ..... LXVI: 3, 3a–c; LXXVII: 5, 5a–f.
gilberti [Obolus (Fordinia)], Walcott ..... LI: 5, 5a–d.
girtyi [Linnarssonella], Walcott ..... LXXVIII: 5, 5a; LXXIX: 1, 1a–r.
(Glyptias) favosa [Obolella], (Linnarsson) ..... LV: 2, 2a–d.
gracia [Acrotreta], Walcott ..... XLVI: 5, 5a–d.
grandis [Lingulella], (Matthew) ..... XXXVIII: 2, 2a–f.
grandis [Lingulella lævis], Matthew ..... XIX: 4c.
granulata [Acrothele (Redlichella)], (Linnarsson) ..... LVI: 2, 2a–n.
granulata [Botsfordia], (Redlich) ..... LVII: 4, 4a–r.
granulata [Discinolepis], Waagen ..... LXXXI: 3, 3a–b.
granulata [Kutorgina], Matthew ..... V: 5, 5a–c.
granvillensis [Lingulella], Walcott ..... XXII: 1, 1a–d.
gregwa [Lingulella (Lingulepis)], (Matthew) ..... XLIV: 1, 1a–p.
gregwa robusta [Lingulella (Lingulepis)], (Matthew). Not figured.
groomi [Obolella], Matley ..... Text fig. 52, p. 596.
gulielmi [Discinopsis] (Matthew) ..... LXXXII: 5, 5a–c.
harlanensis [Wimanella], (Walcott) ..... LXXXVII: 5, 5a–d.
hastingsensis [Eoorthis], (Walcott) ..... XCIV: 3, 3a–c.
hayden [Micromitra], Walcott ..... Text figs. 20A–D, p. 338.
hayesi [Lingulella], (Walcott) ..... XXV: 1, 1a–j.
heberti [Lingulella], Barrois ..... XXXIX: 11, 11a–c.
helena [Lingulella], (Walcott) ..... XXIV: 3, 3a–d.
helena [Protorthis], Walcott ..... XCIX: 4, 4a–b.
Helmersenia ladogensis (Jeremejew) ..... LXIII: 7, 7a–f.
hera [Acrothele subsidua], Walcott ..... LX: 9.
hicksi [Billingsella], (Salter MS.) (Davidson) ..... XCVII: 7, 7a–f.
highlandensis [Billingsella], (Walcott) ..... LXXXVII: 4, 4a–c.
Huenella abnormis (Walcott) ..... CIII: 2, 2a–m; Text fig. 13, p. 299.
billingsi (Walcott) ..... CII: 5, 5a–c.
etheridgei Walcott ..... LXXXIX: 9, 9a.
lesleyi Walcott ..... Text figs. 75A–C, p. 807.
orientalis (Walcott) ..... CIV: 3 3a–b.
texana (Walcott) ..... CIII: 1, 1a–L
texana lævisculus (Walcott) ..... Not figured.
vermontana Walcott ..... Text fig. 76, p. 809.
humillima [Lingulella?], (Barrande) ..... XXX: 12.
hunnebergensis [Protorthis?], Walcott ..... XCV: 5, 5a–c.
ida [Elkania], (Billings) ..... XXX: 20, 20a; LI: 4, 4a–c.
idahoensis [Acrotreta], Walcott ..... LXV: 1, 1a–i; LXVIII: 2, 2a–g.
cf. idahoensis [Acrotreta], Walcott ..... Not figured.
idahoensis alta [Acrotreta], Walcott ..... LXV: 4, 4a–b.
idahoensis sulcata [Acrotreta], Walcott ..... LXV: 5.
iddingsi [Eoorthis], (Walcott) ..... XCI: 3, 3a–b.
inchoans [Acrotreta], (Barrande) ..... XV: 7, 7a.
indianola [Eoorthis], (Walcott) ..... XCIV: 1t, 2, 2a–h.
inflata [Acrotreta], (Matthew) ..... LXXVI: 1, 1a–k; 2, 2a.
? inflatus [Obolus], Westergård ..... Not figured.
ingricus [Obolus apollinis], (Eichwald) ..... Not figured.
ino [Lingulella], (Walcott) ..... XXVI: 4, 4a–b.
insignis [Trematobolus], Matthew ..... LXXXIV: 5, 5a–c.
insons [Lingulella?], (Barrande) ..... XXXII: 2, 2a–e.
insulæ [Lingulella atava], (Matthew) ..... XXXV: 8, 8a.
intermedia [Acrothele], Linnarsson ..... LVI: 3, 3a–d.
inyoensis [Wimanella], Walcott ..... Text figs. 63A–B, p. 747.
iole [Lingulella], (Billings) ..... XXVII: 5, 5a.
(Iphidella) louise [Micromitra], Walcott ..... Text figs. 31A–B, p. 359.
nyssa [Micromitra], Walcott ..... III: 9, 9a.
ornatella [Micromitra], (Linnarsson) ..... III: 6, 6a–d.
pannula [Micromitra], (White) ..... IV: 1, 1a–t; 3, 3a; Text fig. 32, p. 362.
pannula maladensis [Micromitra], (Walcott) ..... IV: 2, 2a–g.
pannula ophirensis [Micromitra], (Walcott) ..... IV: 4, 4a–f.
iphis [Obolus (Westonia)], Walcott ..... XLIX: 4, 4a–d.
irene [Lingulella], (Billings) ..... XXVII: 6, 6a.
iris [Lingulella], (Billings) ..... XXVII: 2.
ismene [Obolus], Walcott ..... XI: 3, 3a–b.
isse [Lingulella], (Walcott) ..... XXXIX: 4, 4a–b; Text figs. 43A–F, p. 510.
(Jamesella) amii [Nisusia], Walcott ..... CI: 6, 6a–b.
argenta [Nisusia], Walcott ..... CI: 9, 9a–b.
erecta [Nisusia], Walcott ..... CI: 5, 5a–b.
? kanabensis [Nisusia] Walcott ..... Not figured.
kuthani [Nisusia], (Pompeckj) ..... CI: 4, 4a–b.
lowi [Nisusia], Walcott ..... Text figs. 61A–D, p. 734.
nautes [Nisusia], (Walcott) ..... XCIII: 6, 6a–b.
pellico [Nisusia], (de Verneuil and Barrande) ..... XCVII: 2, 2a–b.
perpasta [Nisusia], (Pompeckj) ..... CI: 1, 1a–h.
perpasta macra [Nisusia], (Pompeckj) ..... CI: 3, 3a.
perpasta subquadrata [Nisusia], (Pompeckj) ..... CI: 2, 2a–b.
spencei [Nisusia], (Walcott) ..... XCIII: 7, 7a; Text fig. 62, p. 737.
utahensis [Nisusia]. Walcott ..... CI: 10, 10a.
jamesi [Plectorthis], (Hall) ..... XCVI: 5, 5a–c.
johannensis [Eoorthis], (Matthew) ..... XCVII: 10, 10a.
kanabensis [Nisusia? (Jamesella?)], Walcott ..... Not figured.
kayseri [Eoorthis], (Walcott) ..... XCVII: 6, 6a–b.
kempanum [Trematobolus], (Matthew) ..... LXXXIII: 1, 1a–o.
Keyserlingia buchi (de Verneuil) ..... LXXXI: 4, 4a–e.
kichouensis [Eoorthis], (Walcott) ..... LXXXIX: 5.
kiurensis [Lingulella], (Waagen) ..... XXX: 5, 5a; 6, 6a.
kuthani [Nisusia (Jamesella)], (Pompeckj) ..... CI: 4, 4a–b.
kutorgai [Acrotreta], Walcott ..... LXV: 3, 3a–e, g–k; Text fig. 58; p. 692.
Kutorgina cingulata (Billings) ..... V: 1, 1a–s; Text figs. 3 and 8, p. 299, and 50A–C, p. 581.

Kutorgina granulata Matthew ..... V: 5, 5a–c.
peculiaris (Tate) ..... V: 2.
perugata Walcott ..... V: 3, 3a–e.
sardiniaensis Walcott ..... V: 4, 4a–c.
sp. undt. Walcott ..... Not figured.
labradorica [Micromitra (Paterina)], (Billings) ..... II: 2, 2a–f.
labradorica orientalis [Micromitra (Paterina)], (Walcott) ..... II: 2.
labradorica swantonensis [Micromitra (Paterina)], (Walcott) ..... II: 3, 3a–f.
labradorica utahensis [Micromitra (Paterina)], (Walcott) ..... II: 8, 8a; Text fig. 24, p. 350.
labradorica var. [Micromitra (Paterina)] Walcott ..... Not figured.
ladogensis [Helmersenia], (Jeremejew) ..... LXIII: 7, 7a–f.
lævis [Acrothele subsidua], Walcott ..... Not figured.
lævis [Lingulella], Matthew ..... XIX: 4, 4a–b.
lævis grandis [Lingulella], Matthew ..... XIX: 4c.
lævis [Protorthis], Walcott ..... XCIX: 6, 6a–b.
læviusculus [Eoorthis wichitaensis], (Walcott) ..... XCIV: 1p–s.
læviusculus [Huenella texana] (Walcott) ..... Not figured.
lamborni [Obolus], (Meek) ..... XXII: 2, 2a–n.
lamborni minimus [Obolus], (Walcott) ..... XXV: 4, 4a–b.
lamellosus [Obolus (Westonia?)], (Barrande) ..... XII: 7, 7a–d.
lata [Acrothele matthewi], Matthew ..... LXI: 3.
lateralis [Syntrophia], (Whitfield) ..... CII: 6, 6a–g; Text fig. 11, p. 299.
latourensis [Protorthis], (Matthew) ..... XCIX: 3, 3a–d.
leda [Obolus tetonensis], Walcott ..... Not figured.
lens [Lingulella], (Matthew) ..... XXXIII: 1, 1a–d.
lens [Obolus (Palæobolus) bretonensis], (Matthew). Not figured.
lenticularis [Orusia], (Wahlenberg) ..... XCVIII: 1, 1a–p; 2, 2a–k; 3, 3a–b; 6, 6a–d.
lenticularis atrypoides [Orusia], (Matthew) ..... XCVIII: 5.
lenticularis lyncloides [Orusia], (Matthew) ..... XCVIII: 4.
leos [Lingulella], (Walcott) ..... XXIV: 2, 2a–c.
lepis [Lingulella], (Salter) ..... XXXI: 4, 4a–f.
(Leptembolon) lingulæformis [Lingulella], (Mickwitz) ..... XIV: 5, 5a–b.
lesleyi [Huenella], Walcott ..... Text figs. 75A–C, p. 807.
levisensis [Acrothele], Walcott ..... LXXXI: 12, 12a–b.
limöensis [Acrotreta uplandica], (Wiman) ..... LXX: 4, 4a–c.
lindströmi [Billingsella], (Linnarsson) ..... LXXXVII: 6, 6a–f.
lindströmi [Obolella ?], Walcott ..... LV: 4, 4a.
lineolata [Lingulella], (Walcott) ..... XLVIII: 2, 2a–l.
Lingula anatina Bruguière ..... Text figs. 34C–D, p. 374.
Lingula ? eximia Barrande ..... XXXII: 3.
lingulæformis [Lingulella (Leptembolon)], (Mickwitz) ..... XIV: 5, 5a–b.
Lingulella acutangula (Roemer) ..... XVII: 1, 1a–o.
agnostorum (Wallerius) ..... XXX: 15.
ampla (Owen) ..... XXVIII: 1, 1a–j.
arguta (Walcott) ..... XXIV: 5, 5a–b.
atava (Matthew) ..... XXXV: 5, 5a–h.
atava insulæ (Matthew) ..... XXXV: 8, 8a.
auga (Walcott) ..... XXIV: 6, 6a–g.
bella (Walcott) ..... XIX: 2, 2a–q; XXXVI: 4.
bellula (Walcott) ..... XIX: 1, 1a–e.
billingsiana (Whiteaves) ..... XXIX: 3, 3a.
bornemanni (Walcott) ..... XXX: 18, 18a–c.
buttsi Walcott ..... XXIX: 4, 4a–b.
cania (Walcott) ..... XXXV: 3, 3a–d.
cedens (Barrande) ..... XXX: 8.
clarkei Walcott ..... Text figs. 42A–D, p. 486.
collicia (Matthew) ..... XXXV: 1, 1a–f; 2, 2a–d.
concinna Matthew ..... XXXIII: 2, 2a–h; XXXIV: 1, 1a–r.
cuneola (Whitfield) ..... XXVII: 7, 7a–b.
damesi (Walcott) ..... XXXIX: 8, 8a–c.
davidsoni (Barrande) ..... XXXII: 1, 1a–e.
davisi (McCoy) ..... XXX: 2, 2a; XXXI: 6, 6a–h.
Lingulella delgadoi Walcott ..... XXIX: 6, 6a–c.
desiderata (Walcott) ..... XX: 4, 4a–c; 5, 5a–j.
dubia (Walcott) ..... XXIV: 4, 4a.
ellsi (Walcott) ..... XIX: 3, 3a–c.
ferruginea Salter ..... XXIX: 1, 1a–w; XXIX: 2, 2a–f; XXX: 1; XXXI: 3, 3a–c; XXXV: 4, 4a–b.
cf. ferruginea Walcott ..... XXX: 4.
flumenis (Matthew) ..... XXXV: 6, 6a–b.
franklinensis (Walcott) ..... XXVI: 3, 3a–b.
fuchsi Redlich ..... XXXIX: 2, 2a–c; 3.
grandis (Matthew) ..... XXXVIII: 2, 2a–f.
granvillensis Walcott ..... XX: 1, 1a–d.
hayesi (Walcott) ..... XXV: 1, 1a–j.
heberti Barrois ..... XXXIX: 11, 11a–c.
helena (Walcott) ..... XXIV: 3, 3a–d.
? humillima (Barrande) ..... XXX: 12.
ino (Walcott) ..... XXVI: 4, 4a–b.
? insons (Barrande) ..... XXXII: 2, 2a–e.
iole (Billings) ..... XXVII: 5, 5a.
irene (Billings) ..... XXVII: 6, 6a.
iris (Billings) ..... XXVII: 2.
isse (Walcott) ..... XXXIX: 4, 4a–b; Text figs. 43A–F, p. 510.
kiurensis (Waagen) ..... XXX: 5, 5a; 6, 6a.
lævis Matthew ..... XIX: 4, 4a–l.
lævis grandis Matthew ..... XIX: 4c.
lens (Matthew) ..... XXXIII: 1, 1a–d.
leos (Walcott) ..... XXIV: 2, 2a–c.
lepis (Salter) ..... XXXI: 4, 4a–f.
lineolata (Walcott) ..... XLVIII: 2, 2a–l.
linnarssoni (Walcott) ..... XXX: 14, 14a.
manticula (White) ..... XX: 1, 1a–c.
manticula var. ..... Not figured.
martinensis Matthew ..... XXXVIII: 1, 1a–g.
minor (Matthew) ..... XXXVII: 3, 3a–g.
mosia (Hall) ..... XVIII: 1, 1a–f.
mosia osceola (Walcott) ..... XVIII: 2, 2a–c.
nanno (Walcott) ..... XXIV: 1, 1a–d.
nathorsti Linnarsson ..... XXXI: 1, 1a–h.
nicholsoni Callaway ..... XXX: 3, 3a–f.
ora (Walcott) ..... XXXV: 9, 9a–d.
oweni (Walcott) ..... XVIII: 5, 5a–f.
perattenuata (Whitfield) ..... XXI: 1, 1a–i.
phaon (Walcott) ..... XXVI: 1, 1a–e.
pogonipensis (Walcott) ..... XX: 3, 3a–c.
prima (Conrad MS.) (Hall) ..... XXVII: 1, 1a–c.
? primæva Hicks ..... XXXI: 5, 5a.
punctata (Walcott) ..... XX: 6, 6a.
quadrilateralis (Walcott) ..... XXXIX: 6, 6a.
radula Matthew ..... XLV: 1, 1a–l.
randomensis (Walcott) ..... XXI: 5, 5a.
rotunda (Matthew) ..... XXXVII: 3h–k.
schucherti (Walcott) ..... XXI: 6.
siemiradzkii (Walcott) ..... XXXI: 2, 2a.
signata (Barrande) ..... XXX: 11.
similis (Walcott) ..... XXI: 2, 2a–j; 3, 3a–d.
? simplex (Barrande) ..... XXXII: 4, 4a–b.
tarpa (Walcott) ..... XXIII: 2, 2a–c.
texana Walcott ..... XLIX: 3, 3a.
torrentis (Matthew) ..... XXXV: 7.
triparilis (Matthew) ..... XLV: 2, 2a–f; Text figs. 44a–l, p. 537.
tumida Matthew ..... XXIV: 7, 7a–d.
upis (Walcott) ..... XXXVI: 3, 3a.
wanniecki Redlich ..... XXXIX: 1, 1a–n.
welleri (Walcott) ..... XXXVIII: 4, 4a–b.
winona (Hall) ..... XVIII: 3, 3a–b.
winona convexa (Walcott) ..... XVIII: 4, 4a–d.
wirthi (Barrande) ..... XXX: 7.
zeus Walcott ..... Text fig. 45, p. 541.
sp. undt. a Walcott ..... XXX: 13.
sp. undt. b Walcott ..... Not figured.
Lingulella (Leptembolon) lingulæformis (Mickwitz) XIV: 5, 5a–b.

Lingulella (Lingulepis) acuminata (Conrad)....XXXIV: 3, 3a–e; XL: 1, 1a–s; XLI: 1, 1a–n; XLII: 1, 1a–o.
acuminata meeki (Walcott)....XLI: 2, 2a.
acuminata sequens Walcott....Text figs. 46A–B, p. 551.
eros (Walcott)....XXXIX: 9, 9a.
exigua (Matthew)....XXXIII: 4, 4a; XLIII: 1, 1a–z.
gregwa (Matthew)....XLIV: 1, 1a–p.
gregwa robusta (Matthew)....Not figured.
longinervis (Matthew)....XLIV: 2, 2a–g.
pumila (Matthew)....XLV: 3, 3a.
? pygmæa (Salter)....XXX: 10.
roberti (Matthew)....XXXVII: 4, 4a–d.
rowei (Walcott)....XXI: 4, 4a–b.
spatula (Walcott)....XIX: 5, 5a–b.
? squamosa (Holl)....XXX: 9.
starri (Matthew)....XXXVII: 2, 2a–b.
? sp. undt. (Walcott)....Not figured.
(Lingulobolus) affinis [Obolus], (Billings)....XVI: 1, 1a–e.
spissus [Obolus], (Billings)....XVI: 2, 2a–k; XLII: 3, 3a.
Linnarssonella girtyi Walcott....LXXVIII: 5, 5a; LXXIX: 1, 1a–r.
minuta (Hall and Whitfield)....LXXIX: 2, 2a–b.
modesta Walcott....LXXVIII: 8, 8a–f.
nitens Walcott....LXXVIII: 7, 7a.
tennesseensis Walcott....LXXIX: 3, 3a–k.
transversa Walcott....LXXVIII: 6, 6a–c.
urania Walcott....LXXVIII: 9, 9a–c.
linnarssoni [Eoorthis], (Kayser)....XCVII: 5, 5a.
linnarssoni [Lingulella], (Walcott)....XXX: 14, 14a.
lisani [Acrotreta], Walcott....LXVIII: 3, 3a–c.
logani [Micromitra (Paterina)], (Walcott)....II: 6, 6a–b.
longinervis [Lingulella (Lingulepis)], (Matthew)....XLIV: 2, 2a–g.
loperi [Obolus], Walcott....IX: 4, 4a.
(Loperia) dugaldensis [Protorthis], Walcott....XCIX: 5, 5a–j.
louise [Micromitra (Iphidella)], Walcott....Text figs. 31A–B, p. 359.
lowi [Nisusia (Jamesella)], Walcott....Text figs. 61A–D, p. 734.
lusitanica [Delgadella], (Delgado)....XXIX: 5, 5a–b.
lyncioides [Orusia lenticularis], (Matthew)....XCVIII: 4.
meconnelli [Obolus], (Walcott)....XXIII: 3, 3a.
meconnelli decipiens [Obolus], Walcott....XXIII: 4, 4a–b.
meconnelli pelias [Obolus], (Walcott)....XXIII: 3b–c; XXXIX: 5, 5a–c.
macra [Nisusia (Jamesella) perpasta], (Pompeckj)....CI: 3, 3a.
maculata [Acrothele], (Salter)....LVII: 2, 2a–b; LVIII: 2.
mæra [Obolus], (Hall and Whitfield)....X: 2, 2a–e.
magna [Acrotreta sagittalis], (Matthew)....LXVI: 4, 4a–f.
major [Billingsella], Walcott....LXXXVI: 1, 1a.
major [Micromitra (Paterina)], (Walcott)....Text fig. 25, p. 351.
major [Rustella?], (Matthew)....Text fig. 19, p. 328.
maladensis [Micromitra (Iphidella) pannula], (Walcott)....IV: 2, 2a–g.
manitouensis [Schizambon], Walcott....LXXXIV: 3, 3a–c.
manticula [Lingulella], (White)....XX: 1, 1a–c.
marion [Billingsella], Walcott....Text figs. 67A–B, p. 758.
marjumensis [Acrotreta], Walcott....LXXVIII: 2, 2a–d.
martinensis [Lingulella], Matthew....XXXVIII: 1, 1a–g.
matinalis [Obolus], (Hall)....VIII: 1, 1a–k.
matinalis ? [Obolus], Walcott....VIII: 3, 3a.
matthewi [Acrothele], (Hartt)....LXI: 1, 1a–g.
matthewi eryx [Acrothele], Walcott....LXI: 2.
matthewi lata [Acrothele], Walcott....LXI: 3.
matthewi multicostata [Acrothele], Matthew....LXI: 5, 5a–c.
maximus [Obolus apollinis], Mickwitz....VII: 9; XIV: 7, 7a.
meeki [Lingulella (Lingulepis) acuminata], (Walcott)....XLI: 2, 2a.
membranaceus [Obolus], Walcott....Text figs. 36A–B, p. 403.
meneghini [Obolus?], Walcott....XXX: 17, 17a.
(Mickwitzella) siluricus [Obolus], (Eichwald)....XV: 1, 1a–c.
mickwitzi [Obolus], Walcott....X: 1, 1a–k.
Mickwitzia formosa (Wiman)....VI: 3, 3a–c.
monilifera (Linnarsson)....VI: 1, 1a–p; LIX: 2.
occidens Walcott....VI: 4.
pretiosa Walcott....VI: 2.
? sp. undt. Walcott....Not figured.
Micromitra alabamaensis (Walcott)....II: 5, 5a–c.
haydeni Walcott....Text figs. 20A–D, p. 338.
nisus (Walcott)....II: 10.
pealei (Walcott)....III: 3, 3a–e.
pusilla (Linnarsson)....III: 2, 2a–c.
scotica Walcott....Text figs. 21A–C, p. 340.
sculptilis (Meek)....III: 5, 5a–e.
sculptilis endlichi Walcott....Text fig. 22, p. 342.
zenobia Walcott....Text fig. 23, p. 342.
sp. undt. (Walcott)....III: 7.
Micromitra (Iphidella) louise Walcott....Text figs. 31A–D p. 359.
nyssa Walcott....III: 9, 9a.
ornatella (Linnarsson)....III: 6, 6a–d.
pannula (White)....IV: 1, 1a–t; 3, 3a; Text fig. 32, p. 362.
pannula maladensis (Walcott)....IV: 2, 2a–g.
pannula ophirensis (Walcott)....IV: 4, 4a–f.
Micromitra (Paterina) bella (Billings)....II: 1, 1a–c.
crenistria (Walcott)....III: 4, 4a–b.
etheridgei (Tate)....III: 10, 10a–c.
labradorica (Billings)....II: 2, 2a–f.
labradorica orientalis (Walcott)....II: 11.
labradorica swantonensis (Walcott)....II: 3, 3a–f.
labradorica utahensis (Walcott)....II: 8, 8a; Text fig. 24, p. 350.
labradorica var. Walcott....Not figured.
logani (Walcott)....II: 6, 6a–b.
major (Walcott)....Text fig. 25, p. 351.
phillipsi (Holl)....III: 8.
prospectensis (Walcott)....II: 4, 4a.
stissingensis (Dwight)....III: 1, 1a–e.
stissingensis ora Walcott....Not figured.
stuarti Walcott....Text figs. 26A–B, p. 355.
superba (Walcott)....II: 7, 7a–f; Text figs. 27A–B, p. 355.
undosa (Moberg)....Text figs. 28A–C, p. 356.
wapta Walcott....Text figs. 29A–B, p. 357.
williardi Walcott....II: 9b–c; Text figs. 30A–E, p. 358.
microscopica [Acrotreta], (Shumard)....LXVII: 1, 1a–h, 1o, 2, 2a–d.
microscopica missouriensis [Acrotreta], Walcott....LXVII: 4, 4a–b
microscopica tetonensis [Acrotreta], Walcott....LXVII: 3, 3a–d.
minima [Acrotreta ?], (Barrande)....LXXVII: 7, 7a.
minimus [Obolus], Walcott....XI: 8, 8a.
minimus [Obolus lamborni], (Walcott)....XV: 4, 4a–b.
minor [Acrothyra], Walcott....LXXVI: 4, 4a–b.
minor [Lingulella], (Matthew)....XXXVII: 3, 3a–g.
minor [Obolella], (Walcott)....LIV: 3, 3a–d.
minor [Obolus ?], Barrande....XV: 6.
minuta [Acrothele], Walcott....LXIII: 3.
minuta [Linnarssonella], (Hall and Whitfield)....LXXIX: 2, 2a–b.
miqueli [Yorkia?], Walcott....LXXXII: 4.
mirandus [Obolus?], (Barrande)....XII: 4, 4a.
misera [Acrotreta], (Billings)....LXXII: 2, 2a–l.
missouriensis [Acrotreta microscopica], Walcott....LXVII: 4, 4a–b.
mobergi [Obolella], Walcott....LV: 3, 3a–f.
modesta [Linnarssonella], Walcott....LXXVIII: 8, 8a–f.
monilifera [Mickwitzia], (Linnarsson)....VI: 1, 1a–p; LIX: 2.
montanensis [Clarkella], (Walcott)....CIV: 2, 2a–d.
mosia [Lingulella], (Hall)....XVIII: 1, 1a–f.
mosia osceola [Lingulella], (Walcott)....XVIII: 2, 2a–c.
multicostata [Acrothele matthewi], Matthew....LXI: 5, 5a–c.
multisecta [Dalmanella], (Meek)....Text fig. 9, p. 299.
murrayi [Obolus?], Billings....XV: 12.

namouna [Obolus], Walcott....VIII: 2, 2a.
nanno [Lingulella], (Walcott)....XXIV: 1, 1a–d.
nanus [Dicellomus], (Meek and Hayden)....LIII: 1, 1a–l; 2, 2a; 3, 3a–d.
nathorsti [Lingulella], Linnarsson....XXXI: 1, 1a–h.
nautes [Nisusia (Jamesella)], (Walcott)....XCIII: 6, 6a–b.
neboensis [Acrotreta], Walcott....LXXVII: 9, 9a–b.
Neobolus warthi Waagen....I: 3; 4, 4a–b; 5, 5a; LXXXI: 2, 2a–h; Text figs. 47A–B, p. 567.
newberryi [Eoorthis], Walcott....Text figs. 69A–D, p. 783.
newtonensis [Eoorthis], (Weller)....XCVII: 9, 9a.
nicholsoni [Acrotreta], Davidson....LXXIII: 1, 1a–k; 6, 6a–b.
nicholsoni [Lingulella], Callaway....XXX: 3, 3a–f.
ninus [Obolus tetonensis], Walcott....VIII: 11, 1o; XI: 1, 1a–g.
nisus [Micromitra], (Walcott)....II: 10.
Nisusia alberta (Walcott)....C: 3, 3a–d.
compta (Tate)....XCVII: 14.
festinata (Billings)....C: 1, 1a–j; 2, 2a–c; Text fig. 6, p. 299.
festinata transversa (Walcott)....C: 4, 4a–b.
rara Walcott....Text fig. 60, p. 730.
? vaticina (de Verneuil and Barrande)....XCVII: 3, 3a–b.
Nisusia (Jamesella) amii Walcott....CI: 6, 6a–b.
argenta Walcott....CI: 9, 9a–b.
erecta Walcott....CI: 5, 5a–b.
? kanabensis Walcott....Not figured.
kuthani (Pompeckj)....CI: 4, 4a–b.
lowi Walcott....Text figs. 61A–D, p. 734.
nautes (Walcott)....XCIII: 6, 6a–b.
pellico (de Verneuil and Barrande)....XCVII: 2, 2a–b.
perpasta (Pompeckj)....CI: 1, 1a–h.
perpasta macra (Pompeckj)....CI: 3, 3a.
perpasta subquadrata (Pompeckj)....CI: 2, 2a–b.
spencei (Walcott)....XCIII: 7, 7a; Text fig. 62, p. 737.
utahensis Walcott....CI: 10, 10a.
sp. undt. Walcott....Not figured.
nitens [Linnarssonella], Walcott....LXXVIII: 7, 7a.
nitida [Acrothele], (Ford)....LVIII: 4, 4a.
notchensis [Obolus (Westonia)], Walcott....LXIII: 9.
nox [Acrotreta], Walcott....LXXVII: 10.
nundina [Obolus], Walcott....XI: 4, 4a.
nundina [Syntrophia], Walcott....CII: 4, 4a–d.
nympha [Eoorthis desmopleura], (Walcott)....XCVI: 2.
nyssa [Micromitra (Iphidella)], Walcott....III: 9, 9a.
Obolella asiatica Walcott....LV: 6, 6a.
atlantica Walcott....LV: 1a–i; Text fig. 51, p. 590.
chromatica Billings....LIV: 1, 1a–i.
crassa (Hall)....LIV: 2, 2a–n; Text fig. 14, p. 299.
crassa elongata Walcott....LV: 5, 5a.
groomi Matley....Text fig. 52, p. 596.
? lindströmi Walcott....LV: 4, 4a.
minor (Walcott)....LIV: 3, 3a–d.
mobergi Walcott....LV: 3, 3a–f.
vermilionensis Walcott....Text figs. 53A–E, p. 598.
wirrialpensis Etheridge....LV: 7, 7a–b.
Obolella (Glyptias) favosa (Linnarsson)....LV: 2, 2a–d.
Obolus acadicus Walcott....XI: 5.
? advenus Barrande....XII: 5, 5a–b.
anceps Walcott....X: 3, 3a–f.
? ancillus (Barrande)....XII: 2.
apollinis Eichwald....VII: 1–8, 10–1 XIV: 6, 6a; Text figs. 4 and 15, p. 299.
apollinis ingricus (Eichwald)....Not figured.
apollinis maximus Mickwitz....VII: 9; XIV: 7, 7a.
apollinis quenstedti (Mickwitz)....Text figs. 34A–B, p. 374.
Obolus ? bavaricus (Barrande)....XV: 10, 10a.
belli (Billings)....XXXVIII: 3, 3a–b.
chinensis (Walcott)....XXXIX: 7, 7a–b.
complexus Barrande....XII: 3, 3a; 8, 8a.
cyane (Billings)....XXVII: 4, 4a–b.
discoideus (Hall and Whitfield)....XVIII: 6, 6a–d.
dolatus (Sardeson)....Text figs. 35A–B, p. 390.
eichwaldi Mickwitz....Not figured.
elegans Mickwitz....XV: 3.
feistmanteli (Barrande)....XII: 1, 1a–f; 9, 9a.
fragilis (Walcott)....XXIII: 5, 5a–e.
? inflatus Westergård....Not figured.
ismene Walcott....XI: 3, 3a–b.
lamborni (Meek)....XXII: 2, 2a–n.
lamborni minimus (Walcott)....XXV: 4, 4a–b.
loperi Walcott....IX: 4, 4a.
mcconnelli (Walcott)....XXIII: 3, 3a.
mcconnelli decipiens Walcott....XXIII: 4, 4a–b.
mcconnelli pelias (Walcott)....XXIII: 3b–c. XXXIX: 5, 5a–c.
mæra (Hall and Whitfield)....X: 2, 2a–e.
matinalis (Hall)....VIII: 1, 1a–k.
matinalis? (Hall) Walcott....VIII: 3, 3a.
membranaceus Walcott....Text figs. 36A–B, p. 403.
? meneghini Walcott....XXX: 17, 17a.
mickwitzi Walcott....X: 1, 1a–k.
minimus Walcott....XI: 8, 8a.
? minor Barrande....XV: 6.
? mirandus (Barrande)....XII: 4, 4a.
? murrayi Billings....XV: 12.
namouna Walcott....VIII: 2, 2a.
nundina Walcott....XI: 4, 4a.
obscurus Walcott....XI: 9, 9a–d.
? palliatus Barrande....XV: 5.
pandemia Walcott....IX: 3, 3a–d.
panderi Mickwitz....Not figured.
parvus Walcott....Text figs. 37A–B, p. 408.
pheres Walcott....XI: 6, 6a–b.
prindlei (Walcott)....XXVII: 3, 3a–e.
refulgens Matthew....IX: 2, 2a–d.
rhea Walcott....IX: 1, 1a–c.
? rokitzanensis Barrande....XII: 6.
rotundatus (Walcott)....XX: 2, 2a–e.
schmalenseei (Walcott)....XXX: 19, 19a–e.
schmidti Mickwitz....XV: 11a–c.
selwyni (Matthew)....XXXVI: 1, 1a–h; 2, 2a–b; XXXVII: 1, 1a–f.
septalis (Walcott)....XXIII: 3d; XXXIV: 2, 2a.
shansiensis Walcott....XI: 7, 7a–c.
sinoe (Walcott)....XXVI: 2, 2a–h.
smithi Walcott....Text figs. 38A–B, p. 416.
tetonensis Walcott....IX: 5, 5a–d.
tetonensis leda Walcott....Not figured.
tetonensis ninus Walcott....VIII: 11–1o; XI: 1, 1a–g.
? torrentis Matthew....Not figured.
triangularis Mickwitz....Not figured.
volborthi Mickwitz....Not figured.
willisi (Walcott)....XXIII: 1, 1a–j.
wortheni Walcott....IX: 5e; Text figs. 39A–D, p. 421.
zetus (Walcott)....XXV: 3, 3a–e.
? zoppi Walcott....XXX: 16, 16a–b.
sp. undt. a Walcott....X: 4.
sp. undt. b Walcott....Not figured.
sp. undt. c Walcott....Not figured.
sp. undt. d Walcott....Not figured.
sp. undt. e Kayser....XV: 8.
? sp. undt. f Kayser....XV: 9.
sp. undt. g Linnarsson....Not figured.
Obolus (Acritis) antiquissimus (Eichwald)....XIII: 3; XV: 2, 2a–d.

Obolus (Acritis?) rugatus Walcott.....XIII: 2 and 3.
Obolus (Bröggeria) salteri (Holl).....XIII: 1, 1a–n; XV: 4, 4a–d.
Obolus Fordinia bellulus (Walcott).....LI: 3, 3a–f.
gilberti Walcott.....LI: 5, 5a–d.
perfectus Walcott.....LXIII: 10, 10a–d.
Obolus (Lingulobolus) affinis (Billings).....XVI: 1, 1a–e.
spissus (Billings).....XVI: 2, 2a–k; XLII: 3, 3a.
Obolus (Mickwitzella) siluricus (Eichwald).....XV: 1, 1a–c.
Obolus (Palæobolus) bretonensis (Matthew).....XXXII: 5, 5a–g.
bretonensis lens (Matthew).....Not figured.
Obolus (Schmidtia) acuminatus Mickwitz.....XIV: 2 2a–c.
celatus (Volborth).....XIV: 1, 1a–c.
crassus Mickwitz.....XIV: 4, 4a–d.
obtusus Mickwitz.....XIV: 3, 3a–c.
Obolus (Westonia) ålandensis Walcott.....XLVIII: 6, 6a.
aurora (Hall).....XLVI: 1, 1a–h.
baltieus Walcott.....XLVIII: 7, 7a–b.
blackwelderi Walcott.....XXXIX: 10, 10a–c.
bottnicus (Wiman).....XLVIII: 4, 4a–c.
chuarensis (Walcott).....XXV: 2, 2a–e.
dartoni Walcott.....Text figs. 40A–C, p. 455.
ella (Hall and Whitfield).....XXXIII: 3, 3a–c; XLVII: 1, 1a–p.
ella onaquiensis Walcott.....XLIX: 6, 6a.
elongatus Walcott.....LXIII: 8, 8a–d.
escasoni (Matthew).....XLIX: 1, 1a–f.
euglyphus (Walcott).....XLVIII: 1, 1a–f.
finlandensis Walcott.....XLVIII: 3, 3a–b.
iphis Walcott.....XLIX: 4, 4a–d.
? lamellosus (Barrande).....XII: 7, 7a–d.
notchensis Walcott.....LXIII: 9.
rogersi (Walcott).....XLII: 2, 2a–d.
stoneanus (Whitfield).....XXVIII: 2, 2a–g; XLIX: 2, 2a.
themis Walcott.....XI: 2, 2a–c.
wasatchensis Walcott.....XLIX: 5, 5a; Text figs. 41A–F, p. 467.
wimani Walcott.....XLVIII: 5, 5a–b.
sp. undt. a Walcott.....Not figured.
sp. undt. b Walcott.....Not figured.
obscura [Billingsella], Walcott.....LXXXVI: 6.
obscurus [Obolus], Walcott.....XI: 9, 9a–d.
obtusus [Obolus (Schmidtia)], Mickwitz.....XIV: 3, 3a–c.
occidens [Mickwitzia], Walcott.....VI: 4.
œlandica [Acrotreta], Westergård.....Not figured.
onaquiensis [Obolus (Westonia) ella], Walcott.....XLIX: 6, 6a.
ophirensis [Acrotreta], Walcott.....LXXIV: 1, 1a–p.
ophirensis [Micromitra (Iphidella) pannula], (Walcott).....IV: 4, 4a–f.
ophirensis descendens [Acrotreta], Walcott.....LXXVIII: 1, 1a–c.
ophirensis rugosa [Acrotreta], Walcott.....LXXIV: 2, 2a–e.
ora [Lingulella], (Walcott).....XXXV: 9, 9a–d.
Orbiculoidea contraria (Barrande).....LXXXI: 9.
pileolus (Hicks MS.) (Salter).....LXXXI: 11, 11a.
varians (Barrande).....LXXXI: 8.
orientalis [Billingsella], (Whitfield).....LXXXVI: 2, 2a–b.
orientalis [Huenella], (Walcott).....CIV: 3, 3a–b.
orientalis [Micromitra (Paterina) labradorica], (Walcott).....II: 2.
orientalis [Yorkia?], Walcott.....LXXXII: 3, 3a.
ornatella [Micromitra (Iphidella)], (Linnarsson).....III: 6, 6a–d.
orta [Acrothyra signata], Matthew.....LXXX: 3, 3a–b.
orthia [Syntrophia], Walcott.....CIV: 4, 4a–b.
Orusia ? eurekensis (Walcott).....CI: 7, 7a.
lenticularis (Wahlenberg).....XCVIII: 1, 1a–p; 2, 2a–k; 3, 3a–b; 6, 6a–c.
lenticularis atrypoides (Matthew).....XCVIII: 5.
lenticularis lyncioides (Matthew).....XCVIII: 4.
osceola [Finkelnburgia], (Walcott).....XCIII: 1, 1a–h.
osceola [Lingulella mosia], (Walcott).....XVIII: 2, 2a–c.
osceola corrugata [Finkelnburgia], (Walcott).....Not figured.
Otusia sandbergi (Winchell).....XCIII: 4, 4a–d.
utahensis Walcott.....LXXXIX: 3, 3a–c.
ovalis [Acrotreta], Walcott.....XLVI: 2, 2a–b.
oweni [Lingulella], (Walcott).....XVIII: 5, 5a–f.
pacifica [Acrotreta], Walcott.....LXIX: 6, 6a–e.
pagoda [Eoorthis], Walcott.....XCVII: 12, 12a–d.
(Palæobolus) bretonensis [Obolus], (Matthew).....XXXII: 5, 5a–g.
bretonensis lens [Obolus], (Matthew).....Not figured.
palliatus [Obolus ?], Barrande.....XV: 5.
pandemia [Obolus], Walcott.....IX: 3, 3a–d.
panderi [Acrothele], Walcott.....LIX: 5, 5a–e.
panderi [Obolus], Mickwitz.....Not figured.
pannula [Micromitra (Iphidella)], (White).....IV: 1, 1a–t; 3, 3a; Text fig. 32, p. 362.
pannula maladensis [Micromitra (Iphidella)], (Walcott).....IV: 2, 2a–g.
pannula ophirensis [Micromitra (Iphidella)], (Walcott).....IV: 4, 4a–f.
papias [Eoorthis], Walcott.....XCI: 4.
parva [Dalmanella], (de Verneuil).....Text fig. 10, p. 299.
parva [Plectorthis], (Dalman).....XCVI: 6, 6a–g.
parvula [Acrotreta], (Wallerius).....LXXVII: 4, 4a.
parvus [Dicellomus], Walcott.....LXXXIX: 11, 11a–d.
parvus [Obolus], Walcott.....Text figs. 37A–B, p. 408.
(Paterina) bella [Micromitra], (Billings).....II: 1, 1a–c.
crenistria [Micromitra], (Walcott).....III: 4, 4a–b.
etheridgei [Micromitra], (Tate).....III: 10, 10a–c.
labradorica [Micromitra], (Billings).....II: 2, 2a–f.
labradorica orientalis [Micromitra], (Walcott).....II: 2.
labradorica swantonensis [Micromitra], (Walcott).....II: 3, 3a–f.
labradorica utahensis [Micromitra], (Walcott).....II: 8, 8a; Text fig. 24, p. 350.
labradorica var. [Micromitra], Walcott.....Not figured.
logani [Micromitra], (Walcott).....II: 6, 6a–b.
major [Micromitra], (Walcott).....Text fig. 25, p. 351.
phillipsi [Micromitra], (Holl).....III: 8.
prospectensis [Micromitra], (Walcott).....II: 4, 4a.
stissingensis [Micromitra], (Dwight).....III: 1, 1a–e.
stissingensis ora Walcott.....Not figured.
stuarti [Micromitra], Walcott.....Text figs. 26A–B, p. 355.
superba [Micromitra] (Walcott).....II: 7, 7a–f; Text figs. 27A–B, p. 355.
undosa [Micromitra], (Moberg).....Text figs. 28A–C, p. 356.
wapta [Micromitra], Walcott.....Text figs. 29A–B, p. 357.
williardi [Micromitra], Walcott.....II: 9b–c; Text figs. 30A–E, p. 358.
pealei [Micromitra], (Walcott).....III: 3, 3a–e.
pectenoides [Dicellomus], (Whitfield).....LII: 6, 6a–c; Text figs. 48A–B, p. 575.
peculiaris [Kutorgina], (Tate).....V: 2.
pelias [Obolus meconnelli], (Walcott).....XXIII: 3b–c; XXXIX: 5, 5a–c.
pellico [Nisusia (Jamesella)], (de Verneuil and Barrande).....XCVII: 2, 2a–b.
perattenuata [Lingulella], (Whitfield).....XXI: 1, 1a–i.
perfectus [Obolus (Fordinia)], (Walcott).....LXIII: 10, 10a–d.
perpasta [Nisusia (Jamesella)], (Pompeckj).....CI: 1, 1a–h.
perpasta macra [Nisusia (Jamesella)], (Pompeckj).....CI: 3, 3a.
perpasta subquadrata [Nisusia (Jamesella)], (Pompeckj).....CI: 2, 2a–b.
perugata [Kutorgina], Walcott.....V: 3, 3a–e.
phaon [Lingulella], (Walcott).....XXVI: 1, 1a–e.
pheres [Obolus], Walcott.....XI: 6, 6a–b.
Philhedra columbiana (Walcott).....LXXXI: 10.
phillipsi [Micromitra (Paterina)], (Holl).....III: 8.
pileolus [Orbiculoidea], (Salter).....LXXXI: 11, 11a.
Plectorthis jamesi (Hall).....XCVI: 5, 5a–c.
parva (Dalman).....XCVI: 6, 6a–g.
plicatella (Hall).....XCVI: 4, 4a; Text fig. 12, p. 299.
whitfieldi (N. H. Winchell).....XCVI: 3.

plicatella [Billingsella], Walcott....LXXXVI: 3, 3a–n; Text fig. 1, p. 299.
plicatella [Plectorthis], (Hall)....XCVI: 4, 4a; Text fig. 12, p. 299.
pogonipensis [Lingulella], (Walcott)....XX: 3, 3a–c.
politus [Dicellomus], (Hall)....LII: 1, 1a–k; 2, 2a–i; 3; 4, 4a; 5, 5a–b; Text figs. 16A–B, p. 314, and 49A–B, p. 576.
pretiosa [Acrothele], (Billings)....LVIII: 1, 1a–g.
pretiosa [Mickwitzia], Walcott....VI: 2.
prima [Acrothele], (Matthew)....LXI: 6, 6a–b; LXII: 2.
prima [Acrothyra signata], Matthew....LXXX: 2, 2a–b.
prima [Lingulella], (Conrad MS.) (Hall)....XXVII: 1, 1a–c.
prima costata [Acrothele], (Matthew)....LXI: 4, 4a–d.
primæva [Acrothele], (de Verneuil and Barrande)....LVII: 6.
primæva [Acrotreta], Walcott....LXIX: 1, 1a–f.
primæva [Lingulella ?], Hicks....XXXI: 5, 5a.
primordialis [Eoorthis], (de Verneuil and Barrande)....XCVII: 1, 1a–d.
primordialis [Syntrophia], (Whitfield)....CII: 2, 2a–e.
primordialis argia [Syntrophia], Walcott....CII: 3.
prindlei [Obolus], (Walcott)....XXVII: 3, 3a–e.
priscus [Schizambon], Matthew....LXXXIV: 2, 2a–e.
pristinus [Trematobolus], (Matthew)....LXXXIII: 2, 2a–h; LXXXIV: 6.
proavia [Acrothyra], (Matthew)....LXXV: 3; LXXVI: 3, 3a–u.
proles [Acrothele], Matthew....LXII: 3, 3a–c; 4, 4a.
prolificus [Dicellomus], Walcott....LXXXIX: 10, 10a–b.
prospectensis [Micromitra (Paterina)], (Walcott)....II: 4, 4a.
Protorthis billingsi (Hartt)....XCIX: 1, 1a–g.
helena Walcott....XCIX: 4, 4a–b.
? hunnebergensis Walcott....XCV: 5, 5a–c.
lævis Walcott....XCIX: 6, 6a–b.
latourensis (Matthew)....XCIX: 3, 3a–d.
quacoensis (Matthew)....XCIX: 2, 2a–e.
wingi Walcott....XCIII: 5, 5a–e.
sp. undt. Walcott....Not figured.
Protorthis (Loperia) dugaldensis Walcott....XCIX: 5, 5a–j.
pulchra [Botsfordia], (Matthew)....LXII: 5, 5a–l.
pumila [Lingulella (Lingulepis)], (Matthew)....XLV: 3, 3a.
pumpellyi [Billingsella], Walcott....XCVII: 8, 8a–c.
punctata [Lingulella], (Walcott)....XX: 6, 6a.
pusilla [Micromitra], (Linnarsson)....III: 2, 2a–c.
puteis [Acrothele avia], Matthew....Not figured.
pygmæa [Lingulella (Lingulepis)], (Salter)....XXX: 10.
pyxidicula [Acrotreta], White....LXIX: 2, 2a–f; 3, 3a–f.
quacoensis [Protorthis], (Matthew)....XCIX: 2, 2a–e.
quadrilateralis [Lingulella], (Walcott)....XXXIX: 6, 6a.
quadrilineata [Acrothele], Pompeckj....LVII: 5.
Quebecia circe (Billings)....CIV: 7, 7a–g.
quenstedti [Obolus apollinis], (Mickwitz)....Text figs. 34A–B, p. 374.
radula [Lingulella], Matthew....XLV; 1, 1a–l.
randomensis [Lingulella], (Walcott)....XXI; 5, 5a.
rara [Acrothele], (Walcott)....LXIII: 4, 4a.
rara [Nisusia], Walcott....Text fig. 60, p. 730.
recurva [Volborthia], (Kutorga)....I: 6, 6a–e; Text figs. 33A–B, p. 366.
(Redlichella) granulata [Acrothele], (Linnarsson)....LVI: 2, 2a–n.
refulgens [Obolus], Matthew....IX: 2, 2a–d.
remnicha [Eoorthis], (N. H. Winchell)....XCI: 1, 1a–s; XCII: 2, 2a–d; 3, 3a–e; Text fig. 7, p. 299.
remnicha sulcata [Eoorthis], (Walcott)....XCII: 1, 1a–c.
remnicha texana [Eoorthis], (Walcott)....XCII: 4, 4a–g.
remnicha winfieldensis [Eoorthis], (Walcott)....XCI: 2, 2a–e.
retroflexa [Billingsella], (Matthew)....XC: 1, 1a–h.
rhea [Obolus], Walcott....IX: 1, 1a–c.
richthofeni [Billingsella], Walcott....LXXXIX: 1.
roberti [Lingulella (Lingulepis)], (Matthew)....XXXVII: 4, 4a–d.
robusta [Lingulella (Lingulepis) gregwa], (Matthew)....Not figured.
rogersi [Obolus (Westonia)], (Walcott)....XLII: 2, 2a–d.
rokitzanensis [Obolus ?], Barrande....XII: 6.
romingeri [Billingsella], (Barrande)....XC: 2, 2a–n.
rotunda [Lingulella], (Matthew)....XXXVII: 3h–k.
rotundata [Syntrophia], Walcott....CIII: 4, 4a–e.
rotundatus [Obolus], (Walcott)....XX: 2, 2a–e.
rowei [Lingulella (Lingulepis)], (Walcott)....XXI: 4, 4a–b.
rudis [Acrotreta], Walcott....LXV: 3f; LXXV: 1.
rugatus [Obolus (Acritis?)], Walcott....XIII: 2 and 3.
rugosa [Acrotreta ophirensis], Walcott....LXXIV: 2, 2a–e.
rugosa [Schizopholis], Waagen....I: 4c; LXXXI: 1, 1a–c.
rugosicostata [Billingsella exporrecta], Walcott....LXXXVIII: 2, 2a–c.
Rustella edsoni Walcott....I: 1, 1a–e.
? major (Matthew)....Text fig. 19, p. 328.
sabrinæ [Acrotreta], (Callaway)....LXXIII: 5, 5a–d.
saffordi [Wimanella], (Walcott)....LXXXVII: 7, 7a.
sagittalis [Acrotreta], (Salter)....LXXI: 2, 2a–h; 3, 3a–j.
cf. sagittalis [Acrotreta]....Not figured.
sagittalis magna [Acrotreta], (Matthew)....LXVI: 4, 4a–f.
sagittalis taconica [Acrotreta], (Walcott)....LXXI: 1, 1a–o.
sagittalis transversa [Acrotreta], (Hartt)....LXXII: 1, 1a–k.
salemensis [Billingsella], (Walcott)....LXXXVII: 3, 3a.
saltensis [Eoorthis], (Kayser)....XCVII: 11.
salteri [Obolus (Bröggeria)], (Holl)....XIII: 1, 1a–n; XV: 4, 4a–d.
sandbergi [Otusia], (N. H. Winchell)....XCIII: 4, 4a–d.
sardiniaensis [Kutorgina], Walcott....V: 4, 4a–c.
Schizambon? esthonia Walcott....LXXXIV: 4.
manitouensis Walcott....LXXXIV: 3, 3a–e.
priscus Matthew....LXXXIV: 2, 2a–e.
typicalis Walcott....LXXXIV: 1, 1a–d.
Schizopholis rugosa Waagen....I: 4c; LXXXI: 1, 1a–c.
schmalenseei [Acrotreta], Walcott....LXX: 1, 1a–s.
schmalenseei [Obolus], (Walcott)....XXX: 19, 19a–e.
schmidti [Obolus], Mickwitz....XV: 11a–c.
(Schmidtia) acuminatus [Obolus], Mickwitz....XIV: 2, 2a–c.
celatus [Obolus], (Volborth)....XIV: 1, 1a–c.
crassus [Obolus], Mickwitz....XIV: 4, 4a–d.
obtusus [Obolus], Mickwitz....XIV: 3, 3a–c.
schucherti [Lingulella], (Walcott)....XXI: 6.
Schuchertina cambria Walcott....LI: 6, 6a–m.
scotica [Micromitra], Walcott....Text figs. 21A–C, p. 340.
sculptilis [Micromitra], (Meek)....III: 5, 5a–e.
sculptilis endlichi [Micromitra], Walcott....Text fig. 22, p. 342.
seebachi [Acrotreta], Walcott....LXXVII: 3, 3a.
selwyni [Obolus], (Matthew)....XXXVI: 1, 1a–h; 2, 2a–b; XXXVII: 1, 1a–f.
septalis [Obolus], (Walcott)....XXXIV: 2, 2a; XXIII: 3d.
sequens [Lingulella (Lingulepis) acuminata], Walcott....Text figs. 46A–B, p. 551.
sera [Acrothyra], (Matthew)....LXXX: 4, 4a–c; 5, 5a–d; 6, 6a–i; 7, 7a–b; 8?.
shansiensis [Obolus], Walcott....XI: 7, 7a–c.
shantungensis [Acrotreta], Walcott....LXIX: 5, 5a–e.
shelbyensis [Wimanella], Walcott....II: 9, 9a.
siemiradzkii [Lingulella], (Walcott)....XXXI: 2, 2a.
signalis [Acrotreta], Walcott....LXIX: 4.
signata [Acrothyra], Matthew....LXXX: 1, 1a–d.
signata [Lingulella], (Barrande)....XXX: 11.
signata orta [Acrothyra], Matthew....LXXX: 3, 3a–b.
signata prima [Acrothyra], Matthew....LXXX: 2, 2a–b.
silurica [Obolus (Mickwitzella)], (Eichwald)....XV: 1, 1a–c.
similis [Lingulella], (Walcott)....XXI: 2, 2a–j; 3, 3a–d.
simplex [Lingulella ?], (Barrande)....XXXII: 4, 4a–b.
simplex [Wimanella], Walcott....LXXXIX: 2, 2a–e; Text fig. 64, p. 748.
sinoe [Obolus], (Walcott)....XXVI: 2, 2a–h.
Siphonotreta dubia Walcott....LXXXI: 7, 7a–b.
unguiculata (Eichwald)....LXXXI: 6, 6a–e.
verrucosa (Eichwald)....LXXXI: 5, 5a–b.
smithi [Obolus], Walcott....Text figs. 38A–B, p. 416.
socialis [Acrotreta], von Seebach....LXXIII: 3, 3a–c; 4, 4a–e.

spatula [Lingulella (Lingulepis)], (Walcott)....XIX: 5, 5a–b.
spencei [Nisusia (Jamesella)], (Walcott)....XCIII: 7, 7a;
Text fig. 62, p. 737
spinosa [Acrotreta], Walcott....LXXIX: 4, 4a–g.
spissus [Obolus (Lingulobolus)], (Billings)....XVI: 2, 2a–k;
XLII: 3, 3a.
spurri [Acrothele], Walcott....LX: 3, 3a–c.
squamosa [Lingulella (Lingulepis ?)], (Hall)....XXX: 9.
starri [Lingulella (Lingulepis)], (Matthew)....XXXVII: 2, 2a–b.
stoneanus [Obolus (Westonia)], (Whitfield)....XXVIII: 2, 2a–g;
XLIX: 2, 2a.
stissingensis [Micromitra (Paterina)], (Dwight)....III: 1, 1a–e.
stissingensis ora Walcott....Not figured.
striata [Billingsella], Walcott....LXXXVI: 4, 4a–c.
stuarti [Micromitra (Paterina)], Walcott....Text figs. 26A–B,
p. 355.
subconica [Acrotreta], Kutorga....LXXIII: 2, 2a–i.
subequata [Dalmanella], (Conrad)....Text fig. 2, p. 299.
subquadrata [Nisusia (Jamesella) perpasta], (Pompeckj)....CI: 2, 2a–b.
subsidua [Acrothele], (White)....LX: 1, 1a–o; 8.
subsidua hera [Acrothele], (Walcott)....LX: 9.
subsidua lævis [Acrothele], Walcott....Not figured.
sulcata [Acrotreta idahoensis], Walcott....LXV: 5.
sulcata [Eoorthis remnicha], (Walcott)....XCII: 1, 1a–c.
sulcatus [Discinopsis?], Walcott....LXXXII: 6.
superba [Micromitra (Paterina)], (Walcott)....II: 7, 7a–f;
Text figs. 27A–B,
p. 355.
swantonensis [Micromitra (Paterina) labradorica], (Walcott)....II: 3, 3a–f.
Swantonia antiquata (Billings)....CIV: 5, 5a–b.
weeksi Walcott....CIV: 6.
Syntrophia alata Walcott....CIII: 3, 3a–d.
barabuensis (A. Winchell)....CII: 1, 1a–g.
calcifera (Billings)....CIV: 1, 1a–i.
cambria Walcott....Text figs. 72A–D,
p. 800.
campbelli Walcott....Text figs. 73A–F,
p. 801.
lateralis (Whitfield)....CII: 6, 6a–g;
Text fig. 11, p. 299.
nundina Walcott....CII: 4, 4a–d.
orthia Walcott....CIV: 4, 4a–b.
primordialis (Whitfield)....CII: 2, 2a–e.
primordialis argia Walcott....CII: 3.
rotundata Walcott....CIII: 4, 4a–e.
? unxia Walcott....Text fig. 74, p. 805.
taconica [Acrotreta sagittalis], (Walcott)....LXXI: 1, 1a–o.
tarpa [Lingulella], (Walcott)....XXIII: 2, 2a–c.
tatei [Eoorthis], (Etheridge)....XCVII: 15, 15a.
tennesseensis [Linnarssonella], Walcott....LXXIX: 3, 3a–k.
tetonensis [Acrotreta microscopica], Walcott....LXVII: 3, 3a–d.
tetonensis [Obolus], Walcott....IX: 5, 5a–d.
tetonensis leda [Obolus], Walcott....Not figured.
tetonensis ninus [Obolus], Walcott....VIII: 11–1o;
XI: 1, 1a–g.
texana [Eoorthis remnicha], (Walcott)....XCII: 4, 4a–g.
texana [Huenella], (Walcott)....CIII: 1, 1a–i.
texana lævisculus [Huenella], (Walcott)....Not figured.
texana [Lingulella], Walcott....XLIX: 3, 3a.
themis [Obolus (Westonia)], Walcott....XI: 2, 2a–c.
thyone [Eoorthis], Walcott....Text figs. 70A–C,
p. 789.
torrentis [Lingulella], (Matthew)....XXXV: 7.
torrentis [Obolus?], Matthew....Not figured.
transversa [Acrotreta sagittalis], (Hartt)....LXXII: 1, 1a–k.
transversa [Linnarssonella], Walcott....LXXVIII: 6, 6a–c.
transversa [Nisusia festinata], (Walcott)....C: 4, 4a–b.
Trematobolus excelsis Walcott....LXXXII: 8, 8a–b.
insignis Matthew....LXXXIV: 5, 5a–c.
kempanum (Matthew)....LXXXIII: 1, 1a–o.
pristinus (Matthew)....LXXXIII: 2, 2a–h;
LXXXIV: 6.
triangularis [Obolus], Mickwitz....Not figured.
triparilis [Lingulella], (Matthew)....XLV: 2, 2a–f;
Text figs. 44a–l,
p. 537.
tullbergi [Eoorthis], (Walcott)....XCV: 3.
tumida [Lingulella], Matthew....XXIV: 7, 7a–d.
turneri [Acrothele], Walcott....LX: 7, 7a.
typicalis [Schizambon], Walcott....LXXXIV: 1, 1a–d.
ulrichi [Acrotreta], Walcott....LXXVIII: 3.
undosa [Micromitra (Paterina)], (Moberg)....Text figs. 28A–C,
p. 356.
unguiculata [Siphonotreta], (Eichwald)....LXXXI: 6, 6a–e.
unxia [Syntrophia], Walcott....Text fig. 74, p. 805.
upis [Lingulella], (Walcott)....XXXVI: 3, 3a.
uplandica [Acrotreta], Wiman....LXX: 3, 3a–c.
uplandica limöensis [Acrotreta], (Wiman)....LXX: 4, 4a–c.
urania [Linnarssonella], Walcott....LXXVIII: 9, 9a–e.
utahensis [Micromitra (Paterina) labradorica], Walcott....II: 8, 8a;
Text fig. 24, p. 350.
utahensis [Nisusia (Jamesella)], Walcott....CI: 10, 10a.
utahensis [Otusia], (Walcott)....LXXXIX: 3, 3a–c.
varians [Orbiculoidea], (Barrande)....LXXXI: 8.
vaticina [Nisusia ?], (de Verneuil and Barrande)....XCVII: 3, 3a–b.
vermilionensis [Obolella], Walcott....Text figs. 53A–E,
p. 598.
vermontana [Huenella], Walcott....Text fig. 76, p. 809.
verrucosa [Siphonotreta], (Eichwald)....LXXXI: 5, 5a–b.
villaboimensis [Acrothele], Delgado....Not figured.
volborthi [Obolus], Mickwitz....Not figured.
Volborthia recurva (Kutorga)....I: 6, 6a–e;
Text figs. 33A–B,
p. 366.
wanneri [Yorkia], Walcott....LXXXII: 1, 1a–i.
wanniecki [Lingulella], Redlich....XXXIX: 1, 1a–n.
wapta [Micromitra (Paterina)], Walcott....Text figs. 29A–B,
p. 357.
warthi [Neobolus], Waagen....I: 3; 4, 4a–b; 5, 5a;
LXXXI: 2, 2a–h.
Text figs. 47A–B,
p. 567.
warthi [Wynnia], (Waagen)....LXXXIX: 4, 4a–f;
Text fig. 68, p. 771.
wasatchensis [Obolus (Westonia)], Walcott....XLIX: 5, 5a;
Text figs. 41A–F,
p. 467.
washingtonensis [Yorkia?], Walcott....LXXXII: 2, 2a.
weeksi [Swantonia], Walcott....CIV: 6.
welleri [Lingulella], (Walcott)....XXXVIII: 4, 4a–b.
(Westonia) ålandensis [Obolus], Walcott....XLVIII: 6, 6a.
aurora [Obolus], (Hall)....XLVI: 1, 1a–h.
balticus [Obolus], Walcott....XLVIII: 7, 7a–b.
blackwelderi [Obolus], Walcott....XXXIX: 10, 10a–c.
bottnicus [Obolus], (Wiman)....XLVIII: 4, 4a–c.
chuarensis [Obolus], (Walcott)....XXV: 2, 2a–e.
dartoni [Obolus], Walcott....Text figs. 40A–C,
p. 455.
ella [Obolus], (Hall and Whitfield)....XXXIII: 3, 3a–c;
XLVII: 1, 1a–p.
ella onaquiensis [Obolus], Walcott....XLIX: 6, 6a.
elongatus [Obolus], Walcott....LXIII: 8, 8a–d.
escasoni [Obolus], (Matthew)....XLIX: 1, 1a–f.
euglyphus [Obolus], (Walcott)....XLVIII: 1, 1a–f.
finlandensis [Obolus], Walcott....XLVIII: 3, 3a–b.
iphis [Obolus], Walcott....XLIX: 4, 4a–d.
? lamellosus [Obolus ?], (Barrande)....XII: 7, 7a–d.
notchensis [Obolus], Walcott....LXIII: 9.
rogersi [Obolus], (Walcott)....XLII: 2, 2a–d.
stoneanus [Obolus], (Whitfield)....XXVIII: 2, 2a–g;
XLIX: 2, 2a.
themis [Obolus], Walcott....XI: 2, 2a–c.
wasatchensis [Obolus], Walcott....XLIX: 5, 5a;
Text figs. 41A–F,
p. 467.
wimani [Obolus], Walcott....XLVIII: 5, 5a–b.
whiteavesi [Bicia], Walcott....L: 2, 2a–e.
whitfieldi [Billingsella], (Walcott)....LXXXVI: 5, 5a.
whitfieldi [Plectorthis], (N. H. Winchell)....XCVI: 3.
wichitaensis [Eoorthis], (Walcott)....XCIV: 1, 1a–o, 1u.
wichitaensis lævisculus [Eoorthis], (Walcott)....XCIV: 1p–s.
williardi [Micromitra (Paterina)], Walcott....II: 9b–c;
Text figs. 30A–E,
p. 358.
willisi [Obolus], (Walcott)....XXIII: 1, 1a–j.
Wimanella ? anomala (Walcott)....LXXXVII: 1, 1a–e.

Wimanella harlanensis (Walcott)....LXXXVII: 5, 5a–d.
inyoensis Walcott....Text figs. 63A–B, p. 747.
saffordi (Walcott)....LXXXVII: 7, 7a.
shelbyensis Walcott....II: 9, 9a.
simplex Walcott....LXXXIX: 2, 2a–e; Text fig. 64, p. 748.
wimani [Obolus (Westonia)], Walcott....XLVIII: 5, 5a–b.
wimani [Eoorthis], (Walcott)....XCV: 4, 4a–d.
winfieldensis [Eoorthis remnicha], (Walcott)....XCI: 2, 2a–e.
wingi [Protorthis], Walcott....XCIII: 5, 5a–c.
winona [Lingulella], (Hall)....XVIII: 3, 3a–b.
winona convexa [Lingulella], (Walcott)....XVIII: 4, 4a–d.
wirrialpensis [Obolella], Etheridge....LV: 7, 7a–b.
wirthi [Lingulella], (Barrande)....XXX: 7.
woodworthi [Acrothele], Walcott....LX: 6.
wortheni [Obolus], Walcott....IX: 5e; Text figs. 39A–D, p. 421.
Wynnia warthi (Waagen)....LXXXIX: 4, 4a–f; Text fig. 68, p. 771.
yorkensis [Acrothele], Walcott....LIX: 4, 4a–b.
Yorkia? miqueli Walcott....LXXXII: 4.
? orientalis Walcott....LXXXII: 3, 3a.
wanneri Walcott....LXXXII: 1, 1a–i.
? washingtonensis Walcott....LXXXII: 2, 2a.
zeno [Eoorthis], Walcott....Text figs. 71A–B, p. 792.
zenobia [Micromitra], Walcott....Text fig. 23, p. 342.
zetus [Obolus], (Walcott)....XXV: 3, 3a–c.
zeus [Lingulella], Walcott....Text fig. 45, p. 541.
zoppi [Obolus?], Walcott....XXX: 16, 16a–b.

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01363 2625